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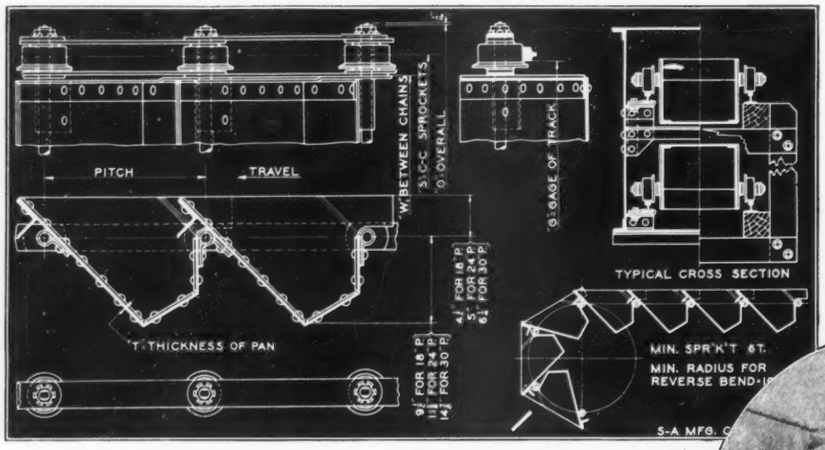

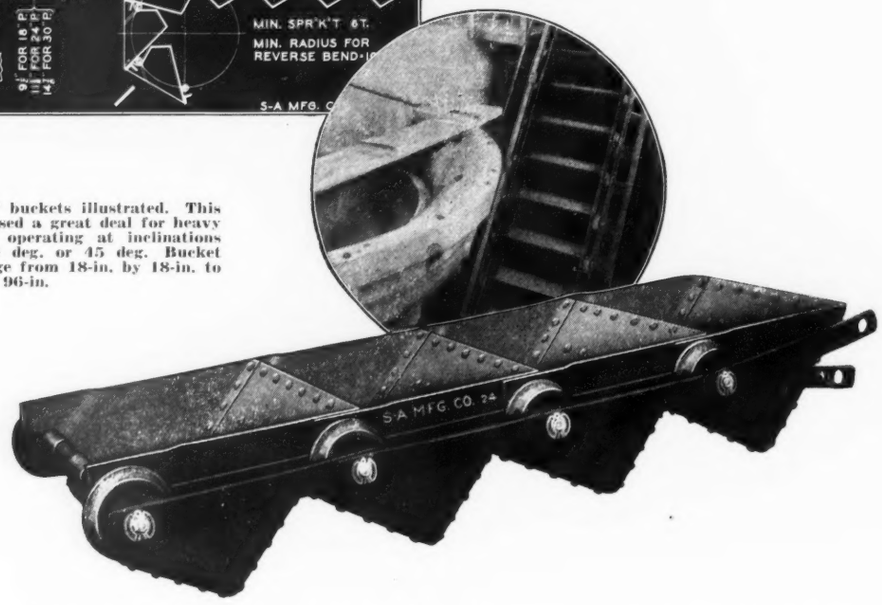

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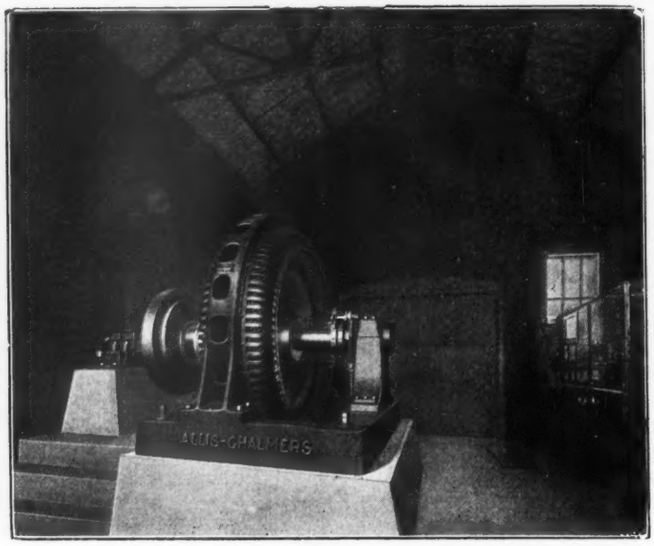

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ENGINEERING AND
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Volume 124 **New York, August 13, 1927** *Number* 7

Manganese Producers Organize

THE PERMANENT ORGANIZATION effected by producers of domestic manganese ore at Washington on Aug. 2, as described in last week's issue, will be advantageous to the producers in many ways. United, they will be better able in the future to resist assaults upon the tariff that makes the continued conduct of their business possible. Stronger in their unity than before, they will be less liable to fresh attacks. The effort to "steal their tariff" doubtless seemed at the outset to their opponents very much like taking candy from a child. The producers now have a collective voice, moreover, that will be more effective in conferences than the voice of any individual member. By their organization they have given definiteness and visibility to an industry that before was scattered and rather vague in form. In fine, the act of organizing the American Manganese Producers' Association puts the domestic manganese industry unmistakably on the map.

Its purpose, the new association announces, is to further the production, beneficiation, and use of domestic manganese ore. It is well that beneficiation is specified, for it is most important. As ways are found of making low-grade ores commercial, the manganese industry will grow. It is in this direction that the domestic industry's future lies. Research will show the way.

A marketing problem also confronts the industry, with exceptions in certain quarters. This will disappear as soon as producers can convince their doubting prospective customers that they can be depended on to meet their contracts in respect to grade and tonnage. Advertising to this end might be used effectively. In this and in disseminating among its members information that will help them in preparing their product for the market the association can be of considerable aid. Here it cannot be too strongly urged that frankness in exchanging data as to improvements in technical processes will pay in the end.

Position of the Union Miniere

PROMISE of better things in the near future is the most encouraging feature of the annual report just issued by the Union Minière du Haut-Katanga, the Belgian corporation that exploits the remarkably rich and extensive copper deposits of the Congo region. As compared with 1925, the year 1926 does not make a good showing. Production in metric tons was 80,639, compared with 90,104 in 1925 and 85,570 in 1924. In the report of Tanganyika Concessions, the British holding company that owns a substantial minority interest in Union Minière, the statement is made that "profits showed an improvement over those for the previous year, allowing for the declaration of a slightly higher dividend, viz. 182.6 francs, against 175.0 francs for 1925." One would gather from this that economies of operation had more than offset the decrease in output and the materially lower average price for copper that prevailed during the latter year. As a matter of fact, the statement is misleading for the reason that the average exchange value of the Belgian franc declined from 4.76c. to 3.26c. The American or British shareholder in Union Minière, or in Tanganyika, would be more interested in the following data, which are a translation of the figures given in the reports into dollars, than in the financial results stated in francs:

	1925	1926
Gross working profits	$7,000,000	$5,500,000
Balance profit for allocation	5,700,000	4,500,000
Dividends per share	8.15	5.90

Production for the first half of 1927 was less by 4,200 tons than that for the corresponding period of 1926, but the expectation is that the last half of the current year will see a marked expansion. A limited supply of labor is one of the serious problems confronting the management in Africa, and the policy during the last year has been to concentrate effort on construction even if production had to suffer. That this procedure was not as disagreeable as it would have been if the copper market had been booming, is to be suspected. However, the new reverberatory-furnace plant, to have an annual capacity of 30,000 to 40,000 metric tons of copper, will be in operation during the closing months of the year; and various installations designed to minimize manual handling of material are nearing completion. The benefit evidently will be twofold: first, a goodly number of men now on construction work will be released for mining and other productive activities; and, second, the output per worker will be increased because of the availability of more efficient plant and equipment. Thus, even where labor is cheap, mechanization is in progress. Availability and efficiency of labor are as much to be considered as a low wage scale.

Incidentally, the leaching-electrolytic plant, with a capacity of 30,000 tons annually; two 10,000-kw. powerhouse units, four additional flotation-plant units; and new surface plants at four mines are nearly if not quite completed. All of these improvements will tend to make possible an increase of output and a diminution of operating costs. Moreover, one of the important activities of the company is that dealing with the employment and care of the natives. A steady increase in the number of workers permanently settled in the immediate vicinity of the company's operations is reported. Satisfactory progress is being made in the construction of the Benguela railroad that will connect the properties with Lobito Bay, on the West Coast; and the line should be open for traffic in about a year.

One thing more is required to enable the Union Minière to fulfill in a reasonable measure the great expectations of the shareholders—that is, a moderately high average market price for the metal. Just how soon that will be realized is uncertain; but Union Minière shareholders should not feel discouraged.

With a Grain of Salt

EVERY NOW AND THEN something crops up to convince one that the world needs more skeptics. This is particularly true in regard to matter that is printed in highly reputable and presumably reliable newspapers. Most of us have a serene confidence that everything that gets into print has behind it the weight of unimpeachable authority. That is not always true. One or two errors have even crept into the *Engineering and Mining Journal* during the last twenty years!

The *United States Daily,* published in Washington, D. C., and edited by David Lawrence and numerous other well-known journalists, plumes itself on its accuracy. Yet in the issue of July 9 is a column story that bears a three-line main head and a three-line bank to this effect:

"Flotation Plants for Treating Ores Are Still in Use—Bureau of Mines Finds Old Methods Used in West; Also in Parts of Mexico"

It will be interesting to the mining industry to know that this ancient process is still in use, even though in such isolated regions as "The West" and Mexico. The *Daily* appears to commend the Bureau for keeping the public posted. One would gather that the archaic process had largely dropped from sight, and that only energetic search on the part of the Bureau engineers had revealed the fact that a few plants still survive.

When one reads something printed in all seriousness that he knows to be ridiculous, he is inclined to wonder how much of the matter that he is not in position to verify is equally far from the truth. The mining man gets a good laugh out of this flotation story because it concerns a matter in which he is particularly posted; but the average man in the street drinks it in as gospel truth. The increasing attention given to engineering news in the general press is encouraging, but, as with the newspaper reports of new medical discoveries, it must be remembered that the stories are written by reporters rather than technicians. A good plan is to depend on technical publications for specialized technical information; and to take with a grain of salt what you read about such matters in newspapers.

Why Not Aid the Prospector?

WHY the old-time prospector is vanishing is not difficult to understand. His grubstaker vanished first and he necessarily followed, inasmuch as the former was his angel, who financed his wanderings through the hills. The disappearance of the grubstaker is due to several causes. In large part it is incidental to the steady transformation of the West. As a country progresses from the undeveloped, sparsely settled state to one of an increasingly denser population, its inhabitants tend to become more conservative. Closer crowding of human beings drives each one in a bit closer to himself. He becomes more reserved in private life and more cautious in his business. The grubstake, small as it is, being without security, becomes more difficult to obtain. While this "hard-boiling" process in the individual is going on, another change that hastens it is under way. Mines become less easy to discover as the more readily found outcrops are taken up. The prospector is less likely to find a valuable deposit; this naturally has its effect in the course of time upon the one who has been furnishing his beans and bacon. For these reasons the prospector has almost vanished from the scene.

Only the grubstake or its equivalent will cause him to return. The question arises, is he needed? Does not the modern way of covering a district systematically with trained geologists and engineers make him quite unnecessary? One must admit that the old prospector found some mines, though not all by any means. If, today, he could be encouraged to resume his former task of patient search for surface showings, supplementing the more systematic but perhaps less thorough work of field geologists, more new discoveries might be made.

In Alaska the Legislature is attempting to restore the prospector to the scene, by granting him a limited annual sum to finance his work, which is to be done under supervision of a kind. In that territory there are still vast areas whose mineral possibilities are scarcely known. In Tasmania a more liberal allowance is made. A similar policy of offering government aid in some of the Western states and in the Canadian provinces might be tried as an experiment. The mining industry needs more new discoveries. Large sums have been spent by state and provincial legislatures for much less sensible purposes.

Cost Cutting Usually Possible

REFINEMENTS in milling practice whereby efficiency may be raised and operating costs reduced play an important part in the economic status of the company, if not of the industry. An example of persistent effort to economize, without sacrifice of any desirable features, has marked the steady progress of a certain mining property since production started several years ago on an ambitious scale. Mistakes were made but they were not fundamental; and gradually the plant was tuned up to a high pitch of large output at low cost. During the early years of development, the type of secondary crusher selected in the first instance was abandoned in favor of a much more complicated unit, but one that was particularly suited to produce what was needed. Higher cost of operation was recognized as inevitable, although every effort was made to minimize working expense, and a net gain was the result.

The trend of modern milling has been in the direction of higher speeds and greater unit output with certain types of machines. This has involved a close study of scientific lubrication, any neglect of which must result in high renewal and repair expense. In the plant in question, apparently, the subject had received adequate attention. Each secondary crusher was equipped with its independent forced-lubrication system, which flushed the bearings with a continuous flow of oil, insuring smooth operation and minimum wear.

It seemed for several years that everything had been done to insure minimum costs. Then attention was paid to the composition of the fluid being circulated as a lubricant. Opportunity for an economical expenditure became apparent, and an oil-purification plant was put in. Repair and renewal costs immediately dropped to a new low level, and the change affected to a noticeable degree the cost of secondary crushing and the expense per unit of metal finally produced.

Nothing is easier than to protest that costs are at a rock-bottom level, with no possibility of decrease. This may be so, of course; but too often the attitude indicates a disregard of the vast possibilities of economy by judicious expenditure in mechanical refinements, the aim of which is to insure a smoothness of operation that automatically reduces the repair bill. The filtering of oil in circuit and the reclaiming of waste oil offer opportunities that justify investigation in many ore-milling plants. The subject is one that has been given much attention in the automobile industry, but with some of the less highly developed forms of machinery thoughts on lubrication are too often confined merely to the question as whether to use oil or grease.

Jolting Mother Earth

FROM THE NORTH comes the tale, unsubstantiated as yet, of a meteor that fell in the Alaska range, splashing a huge tonnage of débris over a considerable area. The account as set forth in the newspaper dispatch seems wildly extravagant. But so does any description of one of nature's wonderful spectacles. Words do not serve to portray them. Were it not for the photographs that have been published of the region about Katmai, the weird story of the Valley of Ten Thousand Smokes would seem utterly fantastic. The great earthquake in Kan-su, in the interior of China, was surely stranger than fiction. So for the moment, until proof is had to the contrary, the imagination may be stimulated by feeding on this latest account of marvels in the North. If, in the end, the tale proves of the fairy variety, the imagination will have had at least its moment of indulgence. It was just such an occurrence by which Meteor Crater in Arizona was formed, according to some. Despite the assertions of those who have held that this crater had other than a meteoric origin, one important company thought well enough of the meteoric theory to spend a large sum in a search for the meteor. The occurrence of meteoric material on the surface and, so it is alleged, in drill holes at depth is weighty evidence of the celestial visitation.

Progress in Mechanization

MECHANIZATION in the mining industry has reached its present status as the result of much effort on the part of numerous agencies. The results so far achieved have been noteworthy, and the industry's current interest in the subject indicates that the arts of mechanical mining are to continue to progress. The growth of mechanization in the United States during recent years is revealed in statistics recently compiled by the Department of Labor and the Federal Reserve Board. These figures show that the productivity of the laborer in industry, taking 1919 as a basis of 100, progressed to 101.8 in 1921, 123.3 in 1923, and 134.0 in 1925. If data were available for 1926 further advance in this direction doubtless would be disclosed. This increase is attributed in part to improved efficiency of labor and of management, but chiefly to the introduction of machinery. These facts should be significant to the mining industry if it is to keep step with the nation's industrial progress.

Platinum Continues to Drag

WHETHER the Russian Soviet ultimately will profit by the recent change of policy in the marketing of platinum remains to be seen. At the moment, and for the last month, the market has been stagnant, with virtually no buying by consumers and with the price nominally around $64 and $65. Until lately the strong world platinum trust, by agreement, had been taking 75,000 oz. of metal each year from the Russians, on which the government monopoly realized approximately $7,000,000 annually—not as profit but as income. However, unsold stocks continued to accumulate; the mines were equipped with more efficient dredges and other machinery, which expanded output or potential output; and the need for ready money became increasingly insistent. Not unnaturally the Soviet wanted to dispose of more platinum. However, the trust, which also was obligated to absorb the production of Colombia and South Africa, could not see its way clear to taking a larger quota from Russia. The evident alternative for the Russians was to begin selling directly to the consumer; and as the big market was in the United States a selling agency was established here. Whether the trust lowered prices and the Russians followed, or whether the reverse order obtained, the result was the same—a collapse from about $100 to $65 in a comparatively short space of time.

As has been stated, buying has been exceedingly small. Naturally the jewelers—who are the biggest factor in consumption—have not bought except for urgent requirements. Moreover, the jewelry business is experiencing a period of exceptional dullness. The wearing of jewelry is not the vogue. One needs only to walk down Fifth Avenue or Main Street to see that neither women nor men are decorating their persons with jewelry to nearly the extent they did a few years ago. This of course may be but a transient phase; but at present it is a recognized factor in the dullness of the jewelry business. Another tendency that has become increasingly marked is the substitution of various alloys and other materials for platinum in chemical and other industrial operations. It is evident that, quite apart from the Russian situation, a slump in the buying of platinum was to be expected. Under the close control that had been exercised by the trust, however, no serious decline in price need have resulted. The policy of raising the price artificially had often had the effect of stimulating rather than depressing the demand.

The expectation of the Russians, according to all reports, was that a moderate decline in the price of platinum would stimulate consumption; that they, accordingly, could sell a much greater quantity than they had been supplying to the trust; and that even if the profit per ounce were diminished materially the gross profit would be increased. This is sound economic theory and, subject to practical limitations, works in the case of most commodities. With platinum there is a difference; the use of the metal for jewelry is based in a large measure at least on the desire of human beings to possess something that is a sign of affluence and that everyone cannot afford to have. It is contended by many in the platinum trade that more metal will be used for making jewelry if the price is well above $100 than if it is considerably below that figure. Whether this belief is correct or not remains to be demonstrated. In any event, this seems to be the crux of the present situation in platinum.

Copper Emerges From a Psychological Slump

AN INTERVIEW WITH

Hamilton Brush

Vice-President
American Smelting & Refining Co.

Better times are ahead of the copper-producing industry as a consequence of a widespread change in sentiment based on factors that are more than temporary and transient, in the opinion of Hamilton Brush, vice-president of the American Smelting & Refining Co. in charge of metal sales. Mr. Brush lays no claims to any psychic pre-vision and admits that he may be wrong. However, he is not one of those habitual optimists who shut their eyes to facts that are unpleasant, and see only the bright spots in any situation. Mr. Brush says:

HAMILTON BRUSH

THE late President Wilson, some years ago, once referred to a period of bad business as a psychological depression. Certainly the mental attitude of both sellers and buyers of copper during the first six months of 1927 was about as depressed as it could be. The newly formed Copper Exporters, Inc., was not popular in Europe; there was much talk of overproduction and of declining consumption. All the bad points were emphasized and stressed and the good points forgotten or overlooked.

After the turn of the half year this psychology started to improve, particularly on the part of the sellers. The improved feeling soon communicated itself to the buyers, first in Europe and then in this country. The change seems to have been initiated with the publication of the statistics for the first half of 1927, followed almost immediately by several intelligent digests and interpretations of these figures that brought out the following:

First, in spite of supposed overproduction and decreased consumption, total world visible stocks of copper which had been 393,000 tons on Jan. 1, 1926, and 412,000 tons on Jan. 1, 1927, were approximately 390,000 tons on July 1, 1927.

Second, of this total tonnage, almost 70 per cent is continuously locked up in process and cannot be released unless copper is no longer to be produced. This quantity of copper in process is absolutely necessary.

Third, while American sellers and buyers were looking fearfully at a reduction of 22,000 tons in domestic deliveries of copper during the first half of this year, they were overlooking the fact that European deliveries of copper during the same period had increased by 58,000 tons and that the increase in total deliveries, therefore, was running at a slightly higher rate than the increase in total production.

Copper is a world commodity; therefore its position can only be judged by world statistics. Two other favorable factors may be added to these.

Fourth, although the European buyer is hardly yet willing to profess open friendship for Copper Exporters, Inc., there is discernible a steadily increased tolerance of the association. The buyers in Europe are beginning to feel that the association is trying to be just and fair; that it is not adopting an arbitrary stand, but is doing everything in its power to smooth out difficulties and minimize complaints. A very large tonnage of copper was sold by Copper Exporters at their lowest price level; and at each successive level established during July.

Fifth, while the Europeans during July were buying more copper than they had bought in any one month since Copper Exporters was organized, the domestic users of copper were buying sparingly. Figures published by the American Bureau of Metal Statistics reveal that the deliveries of copper to American buyers were 5 per cent less in the first six months of 1927 than they were in the same period of 1926. On the other hand, figures of sales of copper assembled by *Engineering and Mining Journal* in connection with its quotational service show a decrease of 16 per cent as compared with the same period of 1926. This seems to indicate that quite promptly either deliveries must show a material decrease or sales must show a material increase.

The best business and banking minds are looking forward to a good fall business. If they are correct, it will mean that deliveries will not decrease, and that therefore sales must increase.

No doubt the modern tendency toward hand-to-mouth buying and low inventories is a sound one. However, if this policy has caused a shrinkage in the volume of buying recently, it is evident that present stocks in the hands of consumers must be at the minimum. The slack has been taken out. Already the price has advanced one cent per pound as a consequence of European buying and improved sentiment. It seems reasonable to expect that the price level will hold, and probably advance when stored-up domestic demand makes itself felt.

Mining and Milling on Santa Catalina Island

By H. S. GIESER
Los Angeles

H. S. Gieser

THE Island of Santa Catalina is one of a group called the Channel Islands, which lie off the southern California coast. These islands, which begin at Santa Barbara and extend as far south as San Diego, because of their mountainous nature may be described as a range out at sea. Santa Catalina is 18 miles off shore, with its harbor of Avalon 27 miles from Los Angeles. It is 22 miles long, varies from 3 to 7 miles wide, and bears northwest. There is a central ridge about 1,500 ft. high for most of the length of the island, with two or three peaks rising to an elevation of 2,100 ft. The general topography is rugged, making road building difficult and costly. The hills are covered with brush.

Santa Catalina's streams are dry in the summer, and fresh water is piped from the interior for domestic use.

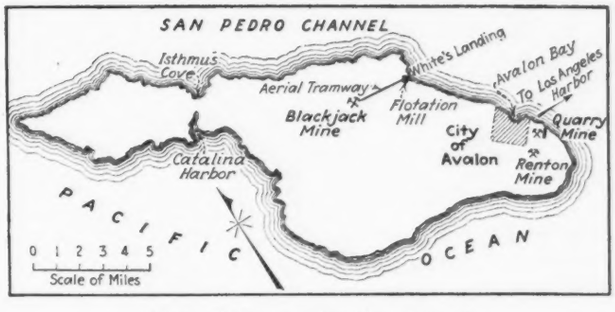
What is probably the first authentic record of discovery of the island is found in the log of Captain Juan Rodriquez Cabrillo, a Portuguese navigator sailing under the flag of Spain. In 1542 this adventurous explorer anchored his small fleet in what is now known as Avalon Bay.

CATALINA ISLAND'S main business is catering to tourists and big-game fishermen. Its climate is very mild, and in summer the resort is well patronized. The travel time from Los Angeles is only three hours. The island has had several small mining booms. There are numerous small, outcropping veins, and quite a few old tunnels and prospect holes. Erosion has been rapid, revealing many galena outcrops. About 1885 an English company operated on the island and shipped some ore. Transportation difficulties, however, forced the company to suspend operations. Probably the most extensive piece of prospecting was done in the early seventies, at the northwest end of the island, by a Frenchman named Bouchet, who put in over 600 ft. of drifts and crosscuts on several small veins.

The Santa Catalina Island Co., which is owned by William Wrigley, Jr., now controls the island. This company operates a tile factory, making roofing tile, flat tile, bricks, and other clay products utilizing clay and diatomaceous earth that are found on the island; a rock quarry; one of the largest Diesel-engine electric-generating plants in the country; three hotels; a steamship line; a poultry ranch; a nursery; a country club and ball park; a lumber yard; a garage; and also, three mines—Renton, Black Jack, and Quarry—and a 100-ton flotation mill.

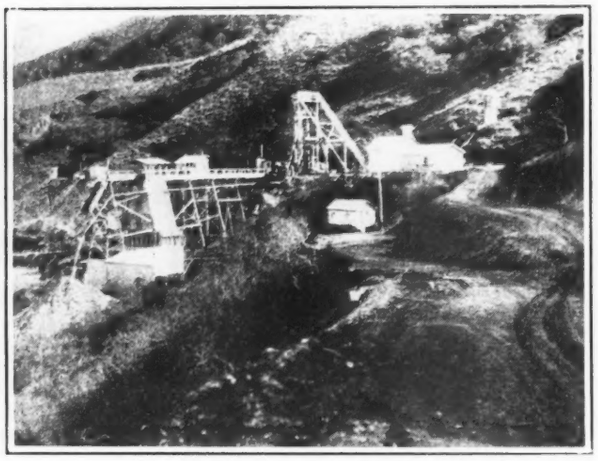
RENTON mine, which is located in a gulch a short distance from the sea near the southeast end of the island and about 3½ miles from Avalon, on the east coast, is developed by tunnels. The country rock is an andesite, finely porphyritic. At the Renton the vein is of the sheeted-zone type, with considerable replacement of the wall rock. In the enriched portion it is as much as 20 ft. in width. The primary ore portions, however, do not exceed 4 ft. in width. No. 1 tunnel is situated at an elevation of 1,084 ft., but No. 4 tunnel, which is the main level and where the principal development is being done, is at an elevation of 717 ft. Two additional veins are now being developed at an elevation of 517 ft. The economic minerals are sphalerite (variety black jack), and argentiferous galena, with pyrite coming in as the mine gets deeper. The gangue consists of barite, with subordinate quartz and calcite and highly altered wall rock. Ore frequently comes in alternate bands; vugs are numerous. Silver is not so important as at the Black Jack mine. The average dip of the vein is 65 deg. north; the strike is south 82 deg. West. Ore is transported to the beach by a 3,700-ft. aërial tramway, and is there loaded on barges.

QUARRY MINE is located on the coast a short distance from the Renton. In this mine, the vein was uncovered while quarrying rock for a local crushing plant which supplies crushed rock for concrete purposes. The mine formerly produced high-grade zinc ore. In 14 months the production was about 10,000



Map of Santa Catalina Island

tons, averaging 2.5 oz. silver, 1.1 per cent lead, and 13.0 per cent zinc. It is developed by a tunnel at an elevation of 265 ft. and a winze to within 5 ft. of sea level. The strike of the vein is north 71 deg. west; the dip is 78 deg. southwest. The geology is similar to that of the Renton mine. Production is not now important. The deposits of the two properties at this end of the island

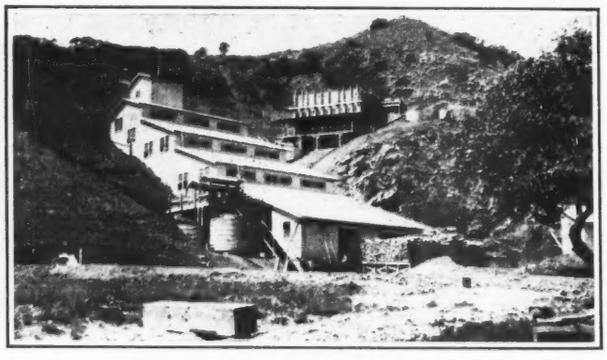


Black Jack shaft

are probably of the low-temperature zone type. The ore is towed in barges of 180 to 250 tons' capacity up the coast to Whites Landing, where the mill is located, and then hauled by motor truck to the mill coarse-ore bin.

Black Jack mine is situated 5½ miles northwest of Avalon, and west of the mill, on the north side of Black Jack Peak at an elevation of 1,540 ft. The 400 and 500 levels are worked from a three-compartment shaft 525 ft. deep. The upper levels were worked by a tunnel and a 255-ft. winze. In the winze levels the vein is 3 to 5 ft. wide. At the 400 ft. level it is 5½ ft. wide, and at the 500 ft. level it has a maximum width of 26 ft., but is of lower grade with an average grade streak 5 ft. wide on the footwall.

The Black Jack vein is associated with Franciscan metamorphics; it is in a faulted zone at the contact of black quartzose shale, and a quartz-albite-chlorite schist. It strikes south 5 deg. east, and dips 70 deg. east. The



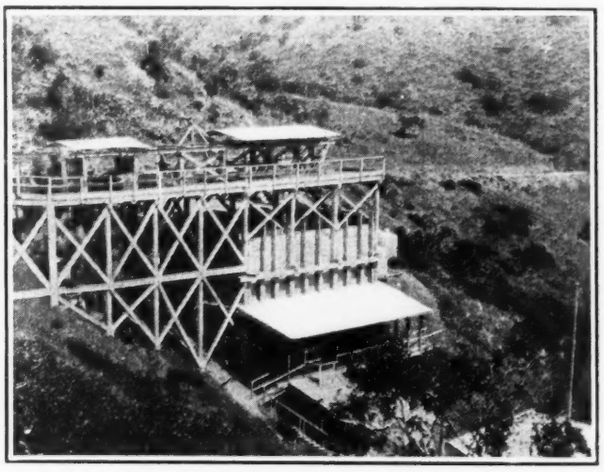
Black Jack 100-ton flotation mill

economic minerals are, in the upper levels, high-grade argentiferous galena; at about 250 ft. depth sphalerite comes in and below the 400 level it becomes the principal mineral. Pyrite, carrying 3 to 5 per cent copper, comes in at the 500 level, but it is not as important at the Black Jack as at the other properties. The gangue minerals are the same as those previously mentioned. There are some oxidized zinc minerals present; also traces of a nickel silicate in the schist, and millerite in the ore. The ore deposit of this property is probably of the intermediate-zone type. It was originally located many years ago. Ore is transported to the mill by an aërial tramway 9,900 ft. long, erected at a cost of $30,000. The ore capacity of the buckets is 800 lb.

As there are numerous veins on the island, prospecting is being carried on at several places. At present one prospect at the isthmus, 14 miles northwest of Avalon, appears very promising.

The 100-ton flotation mill is situated at White's Landing, on the east coast of the island about 4 miles north of Avalon, near the mouth of a small valley which furnishes a good location and fresh water for the camp. To a mill man who has spent many years in narrow canyons and snow-covered hillsides the location is almost ideal. There is a sandy beach protected from west winds and the glare of the setting sun where bathing can be indulged in five or six months of the year. Off shore there is a big-game fishing ground second to none in the world, where anglers take 200-lb. leaping tunas on a small line; also enormous swordfish and bass.

There are numerous goats on the island, originally tame but now very shy. The old ones are tough and

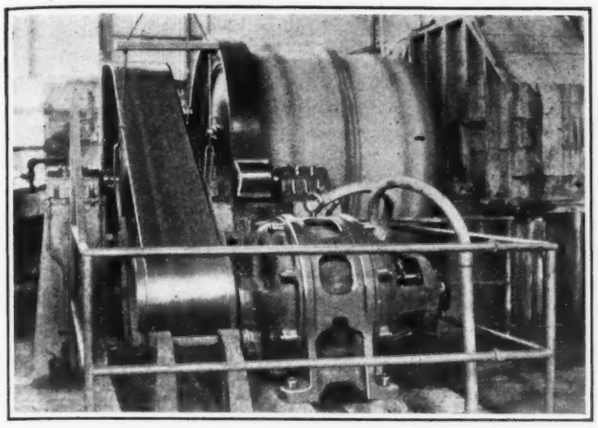


Tramway terminal and coarse-ore bin

strong, but the younger ones make delicious eating. There are also foxes, quail and doves.

The mill is unique in that selective flotation of a lead-zinc ore is carried out in a sea-water circuit. Sea water itself is slightly alkaline to phenol-phthalein, but soda ash is used in addition, and sodium cyanide for depressing. Cresylic acid is used for the frother agent, and xanthate and Barrett No. 634 are used to float the lead. Copper sulphate is used to reactivate the zinc, and more xanthate and No. 634 used to float it. Sea water froths somewhat; it has some organic compounds present from the kelp beds off shore, and their effect is to make a sloppy froth, which, like most sloppy froths, is not very selective. It was accidentally discovered that the addition of a small quantity of kerosene made a more brittle froth which made it possible to drop out the iron and to clean up the zinc better.

Ore is conveyed from the coarse-ore bin of 400 tons' capacity, which is at the end of the aërial tramway, and falls on a 1½-in. grizzly, the undersize going to a small Blake crusher, where it is broken to 1½ in. It is then conveyed to a fine-ore bin of 100 tons' capacity at the



Ball mill at the Catalina Island concentrator

upper end of the mill. Here an ore feeder discharges into a 64½-in. Marcy ball mill, using 4- and 5-in. chrome balls and operating in closed circuit with a 4½ by 18 ft. Dorr duplex classifier. The grinding was formerly to minus-65 mesh on a 100-ton per day basis, but the mill is now treating 135 tons per day, so that the grinding is somewhat coarser.

Two Agitators Used

Cresylic acid, xanthate, and Barrett No. 634 are added to the pulp in a Devereux agitator 4 ft. in diameter and 4 ft. high. The ore pulp then passes to a 10-ft. K. & K. double spitz flotation machine of the horizontal rotor type, where a low-grade lead concentrate is produced. The tailing goes to another similar machine, where a middling is produced and returned to the first machine for re-treatment. The low-grade lead concentrate is cleaned in a 6-ft. single spitz K. & K. machine, where a final lead concentrate is made, and a tailing which is returned to the head of the circuit.

To the tailing from the lead roughers is added copper sulphate, more xanthate and Barrett No. 634 in another Devereux agitator 4 ft. in diameter and 4 ft. high. The ore pulp then passes to another 10-ft. double spitz K. & K. flotation machine, where a low-grade zinc concentrate is produced. The tailing goes to another similar machine, making a middling which is returned to the head of the zinc circuit, and a tailing which is pumped to two Cottrell tables with 10 ft. decks, which are used as indicators only; the tailing passes across the tables to a waste launder leading to the bay.

THE low-grade zinc concentrate is cleaned and recleaned in two 6-ft. single spitz K. & K. machines, the tailing from which joins the head of the rougher zinc circuit. Kerosene is used in the zinc cleaners to drop out some iron, as previously mentioned. The cleaned zinc concentrate goes to two additional Cottrell tables, where some lead is separated out. The final zinc concentrate goes to a 14-ft. by 8-ft. Dorr thickener and thence to an Oliver filter 5 ft. 4 in. in diameter and 4 ft. long, from which it is dropped into sacks for shipment to Belgium. Lead concentrate goes to a 10 ft. by 8 ft. Dorr thickener and thence to an Oliver filter 3 ft. in diameter and 4 ft. long, the dewatered product being directed into sacks for shipment to Selby, Calif. The ratio of concentration is about 7 to 1. Tables showing the approximate reagent consumption, and typical assay values of mill heads, concentrates, and tailing, follow:

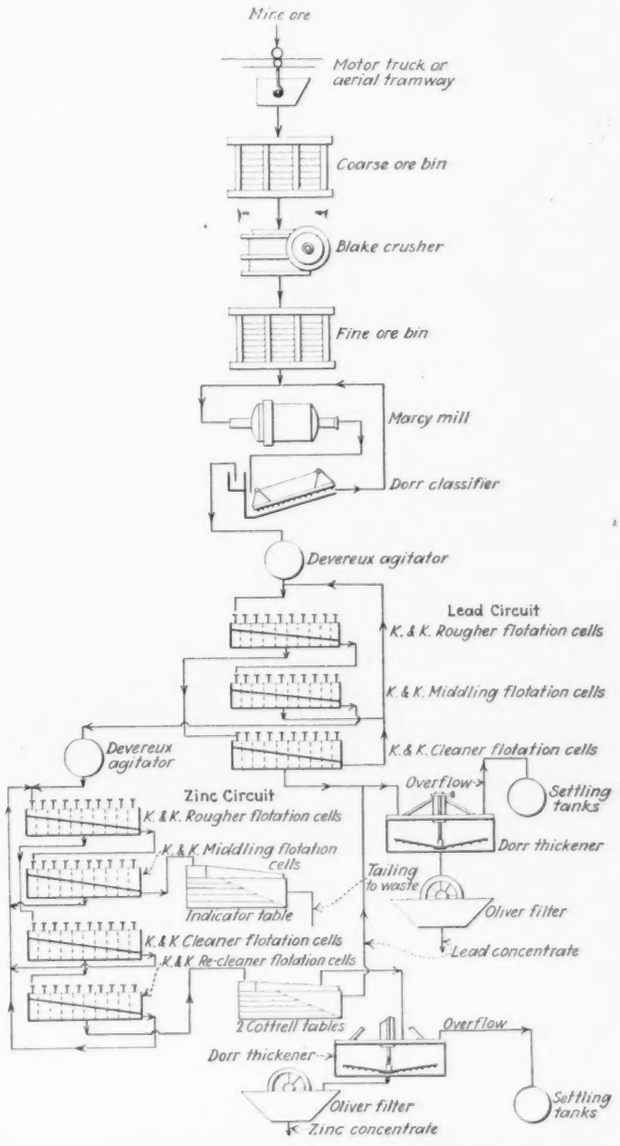
Approximate Reagent Consumption

Reagent	Pounds Per Ton
Soda ash	1.0 to 1.5
Cresylic acid	0.03 to 0.05
Sodium cyanide	0.18 to 0.22
Xanthate	0.10 to 0.15
Barrett No. 634	0.08 to 0.12
Kerosene	Small quantity as required

Assay Values

	Lead Per Cent	Zinc Per Cent	Silver Ounces
Heads	2.3	8.4	6.2
Lead concentrate	51.2	11.0	106.0
Zinc concentrate	3.4	47.7	8.8
Tailing	0.2	1.3	0.4

The mill was designed and erected by the Southwestern Engineering Corporation, of Los Angeles, about eighteen months ago. It is clean, well laid out, and is an excellent example of modern practice. I am indebted to George H. Newman, of the engineering department of the Santa Catalina Island Co., for information relative to the geology of the properties; to A. H. Connors, mill foreman, for information about the mill, and to D. M. Renton, general manager, for permission to publish this article.



Flow sheet of 100-ton flotation mill

Notes on the Zinc-Smelting Industry of Belgium

By E. G. LAWFORD
Assistant Editor

DURING 1926 Belgium produced 191,000 metric tons of zinc, or approximately 14 per cent of the world's production. The Belgian industry is peculiar in that of the ores treated practically none are actually mined in Belgium, but are shipped from Sweden, Sardinia, Africa, Mexico, Italy, and elsewhere.

About eighteen months ago the shortage of ores was so great that Belgian smelters were compelled to sign some very onerous contracts with the mines to keep their smelting plants in operation at something approximating their full capacity. Since then, however, the Belgian smelters have adopted such energetic measures to assure ore supplies that their present position in many instances is sufficiently favorable to warrant the undertaking of important extensions and improvements in their smelting plants. The measures adopted have been the acquisition of large interests in zinc-mining enterprises and the formation of a central purchasing organization, the Société des Usines de Zinc, of which, with one important exception, nearly all the Belgian smelters are members. There is also a company in Mexico which is engaged in contracting sales of the growing Mexican ore production for the benefit of the Belgian smelters.

A large tonnage of zinc concentrates produced by selective flotation of lead-zinc ores is now available, and it may even be possible that today an over-supply of ores and concentrates is available for smelting.

Zinc Smelting Industry Flourishing

The industry is at the moment undoubtedly flourishing, but there is a good deal of uneasiness as to the future production of America, and as to whether or not the price of zinc will be lowered still further by shipments to Europe of large quantities of electrolytic zinc. Notwithstanding this, the intention would seem to be to "make hay while the sun shines," as evidenced by the new furnace construction and modernization to be seen at so many plants.

Furthermore, a body of European opinion is doubtful whether American electrolytic zinc could be placed on the European market for much less than £25 a long ton, whereas with the low wages and depreciated currency operating in their favor, the Belgian smelters are probably producing zinc at about £18 to £22 per long ton.

The abundant supply of coal, the cheap canal transport, labor at 25 to 35 Belgian francs per shift, and the depreciated currency are all factors operating in favor of low costs.

Quite obviously the internal purchasing power of the Belgian franc is far higher than indicated by the international exchange value. Consequently, since zinc prices are based on the London quotation in sterling, the depreciated currency is a factor of great advantage to the smelters, in view of the fact that raw materials are manufactured in Belgium and paid for in what may be called the internal franc, whereas the product is exported and paid for in currency of a very high franc exchange value.

The visitor to the Belgian smelters cannot but be impressed by the very important part played by the country's canal system. The discharge into the air of sulphur dioxide fumes has always been prohibited by law anywhere near towns, whereas in other respects smelter sites in the immediate vicinity of large cities have, of course, great advantages. With canal transport at 9 francs per 100 kilometer-ton it has been found possible to locate roasting plant and lead furnaces at one place and the retort plant at another 100 or more kilometers distant. The retort residues are returned to the lead plant, so that there is continual traffic of 300-ton capacity barges between the two places. Nowadays, of course, all the roasting plants are equipped for sulphuric acid manufacture, but their location has remained as before, so little burden is the transport charge on the total cost.

Furthermore, an important consideration in locating European acid plants seems to be the available local market. Sulphuric acid transport by rail in special tank cars is expensive, whereas, as pointed out above, the canal freights on roasted ore are very low. The canal system is used almost entirely for the transport of raw ores from the seaports to the roasting plants.

Welfare Work

The larger companies spend considerable sums of money on housing and welfare work. In one instance, every workman has a small plot of land, on which he is encouraged to raise vegetables. Churches, schools, bakeries, and dairy farms are run by the companies. The cost of living is thus kept down to a minimum. In addition, the companies habitually set aside large sums for pensions and benefits. There can be little question that such a policy is far-sighted and diplomatic. It allows money actually paid out in wages to be kept at a very low level, because, in effect, the balance due to labor from a humanitarian standpoint is collectively and efficiently spent on the work people in a more intelligent and productive way than it would be were the sum parceled out as higher wages to the individual worker. The effect seems to be the permanent maintenance of an industrious and contented community centered round the works, and men work for a lifetime for one company, knowing that their old age will be well cared for.

Metallurgical Improvement

The metallurgical improvements consist for the most part of installations of new roasting furnaces of the Spirlet type and gas-fired regenerative furnaces of the Dor type for retorting; the Spirlet circular revolving hearth to replace the old-fashioned rectangular stationary hearth type, and the Dor furnace to replace direct-fired and smaller retort furnaces, effecting large reductions in the coal consumption. Certain of the new furnaces in Belgium are now working with a coal consumption of only 100 per cent of the zinc-bearing material charged to the pots.

One large company is preparing to install the Harris process for lead-bullion refining, and has also installed two large Cottrell precipitation plants, one in connection with its lead-plant furnaces, and another to precipitate lead and zinc fume from its roasting plant gases, thereby rendering them more suitable for acid manufacture by catalytic as opposed to chamber processes.

Considering that only eight years ago the Belgian zinc plants were all in territory occupied by a hostile army, and that many were actually damaged as a result of military operations, it is obvious that much energy and hard work have been expended by all concerned to restore the industry to its present-day prosperity.

St. Joseph Lead Co. Prospects a Chat Pile

By CLARENCE L. LARSON
Rivermines, Mo.

IN THE SOUTHEAST MISSOURI lead district the rejected tailing from jigs and tables has always been called "chat" or "chats." The general, rather flat, rolling country has forced the heaping of these rejects into huge piles. Of these, the largest two are roughly calculated to contain now about 15,000,000 tons of tailing each, and both are receiving a daily increase of several thousand tons from their mills.

The St. Joseph Lead Co., by drilling, recently prospected the chat pile at the now abandoned No. 4 mill, one mile south of Rivermines, Mo., which it acquired with other holdings from the Federal Lead Co. several years ago. This is one of the smaller and older piles, and, as it held out some promise of worth for re-working by flotation, it was decided to test it by drilling. A stadia survey of the pile was first made. The composite blueprint of the profiles of the original ground level and the surface of the chat pile then served nicely for locating the holes and for instantly and closely estimating their depths to the ground level. The maximum height of the pile proved to be 120 ft. Holes were spaced from 150 to 200 ft. apart. measuring around the various prongs of the pile, and about two-thirds of the distance along the slope up the pile from the ground. Maximum hole depth was 85 ft., minimum 45, and average 67.

Results of a screen test are given in the following table. This affords an idea of the average run of the chat in this pile:

Size	Per Cent Weight	Size	Per Cent Weight
On 15 mm	1.1	On 6 mesh	10.6
On 12 mm	3.1	On 10 mesh	17.6
On 9 mm	8.8	On 14 mesh	7.7
On 3 mesh	2.4	Thru 14 mesh	35.3
On 4 mesh	13.4		
Total			100.0

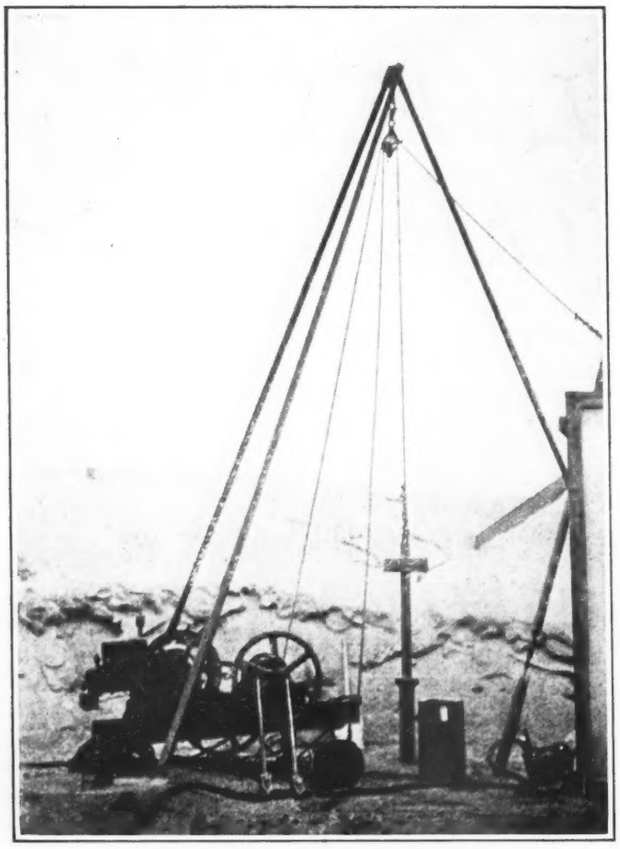
A drilling outfit was suggested by an engineering company which specializes in prospecting equipment, a quite radical modification of the company's standard prospecting drill. The original proposal, together with its quotations, follows:

40 lengths of 4-in. casing @ $30.25	$1,210.00
2 casing heads @ $28.80	57.60
5 cutting shoes @ $20.50	102.50
1 pulling cap	55.50
2 driving caps @ $16.40	32.80
1 casing pulling stand	68.50
1 chain sling for pulling casing	22.60
2 plain drill pumps @ $56.70	113.40
1 extra-heavy rock bit	66.50
1 gripping device (casing safety clamp)	29.20
1 casing centering device	28.50
2 vacuum pumps @ $65.40	130.80
1 casing pulling jack	178.25
2 pair chain tongs	20.00
1 driving ram	70.00
1 drill jar-stem	85.00
1 tripod	95.00
1 portable power winch	350.00
500 ft. of rope	30.00

Not all of these items were ordered after due consideration of local conditions and needs. For instance, although one of the St. Joseph Lead Co.'s engineers reported fine and economical use of the casing quoted on in test work among South American gold-gravel deposits, it was felt that the price was excessive for the modest chat-drilling campaign that was under consideration. Therefore extra-heavy 4-in. pipe was purchased from St. Louis. This was cut into 5-ft. sections in the Rivermines machine shop and then threaded similarly to the flush-joint square-cut thread developed in the local diamond drilling. A detailed sketch is shown on page 252. Some items on the proposed list were reduced in number and others eliminated entirely, or furnished from the Rivermines supply yard.

Chat-pile topography

THE casing pipe made one truck load from yard to the chat pile. Then the power which was loaded on the truck and the rest of the equipment and supplies was dragged behind the truck in a diamond-drill shanty,



Driving ram at beginning of drop

an 8x8-ft. shack of 2x4-in. scantlings, sheathed over with corrugated galvanized iron and mounted on two steel-shod runners.

A mule team with block and tackle, the driver, and two drill men were required to get the equipment up the chat pile to the first hole spotted. This job required most of the first day. Subsequently a team was needed only once in moving the rig and that for about three hours only when moving from one prong of the pile up a steep slope to another prong. Otherwise all moving was done by hand and will be discussed in detail later.

Two men operated the rig, a driller (at $4.55 per eight hours) and a helper (at $3.85 per eight hours). Two shovelers (at $3.85 per eight hours) were used part of the time to prepare roads over the chat for moving and to level off the space required for setting up. Drilling was done only in the daytime, nine-hour shifts being the rule.

In moving, three men easily carried the tripod on their shoulders to the next hole, the fore-pole stretched out ahead, the other two poles straight back. The tripod was made in the Rivermines shop from three 20-ft. lengths of 2-in. pipe. The top ends were heated and then flattened for about 12 in. from the ends. Through the flattened portions a ¾-in. bolt was passed and from it was hung a U-bolt of ⅝-in. iron. The tripod was set with the rear poles about 9 ft. apart and the fore-pole about 15 ft. ahead. This gave ample room to run the power winch between the rear poles and up to about 3 ft. from the hole spotted. Before raising the tripod the rope block was hung on the U-bolt, the block being of steel, of swivel style, and having two pulleys carrying separate ¾-in. manila ropes. One rope was for the sand pump and its jar and the other for the driving ram, these tools being permanently spliced or clamped to their respective ropes. Each tripod pole was set upon a piece of 2-in. plank, 2 ft. long, having wooden cleats on the upper side and in the center, which formed a slip-proof socket into which the foot of the pipe was placed. The boards kept the tripod poles from sinking into the chat. They were sloped so that they lay at right angles to the poles.

The holes were drilled in consecutive order around the chat pile, and clockwise looking down upon it. This procedure put the drum of the power winch on the outside, thus requiring the shoveling of a narrower road for moving and bringing the weight of the winch closer to the pile, where the road was better packed than toward the outer edge. On only one hole was this method reversed.

THE drilling referred to in this article was done during December and January under all the extremes of weather conditions—both cold and warm, with snowy and rainy alternations. When the chat was frozen, the power winch was moved over it easily by four men. On the warmer days the chat thawed quickly, and it then became necessary to use 2x8-in. boards for tracking the wheels. A windbreak of 4x8-ft. flat galvanized sheets over a 2x4-in. framework was provided in conjunction with a coke-fueled "salamander." This eloquently named bit of equipment was made from an old iron oil barrel. The top was first knocked out, and then a few holes were punched with a pick around the barrel about a foot from the bottom. Through these holes several small bars were inserted and upon these was placed a small piece of punched sheet iron for a grate. One big hole on the side of the barrel below the grate level, and the "salamander" was complete—a blessing extraordinary, when drilling in windy mid-winter on top of the "Chat Mountains."

By the time a hole was bottomed the road to the next hole would be ready and a spot there all leveled off for the set-up. Shovelers and drillers then moved the windbreak, tripod, and power winch. While the shovelers then carried forward the smaller materials the drillers moved the water line. Water was available at the bottom of the chat pile from a mine pump house, and from this source a ¾-in. line was stretched to the top of the pile. This proved to be flexible and easily moved along the pile while still connected. A 25-ft. length of ½-in. rubber hose with a valve at the outlet was provided at the drill.

The portable power winch, which is clearly shown in the accompanying pictures, consists of a single-cylinder gas engine mounted on a rigid steel frame and wheels and geared to a small drum. Two or three turns of the ¾-in. rope around the drum were sufficient to handle either the driving ram or the sand pump. With the engine running constantly, the operator used only an easy pull on the loose end of the rope to handle the tools at will.

AS CAN be seen in the photographs, the driving ram consists of a guide rod 3 in. in diameter weighted at the top by two steel weights 4 in. square and 13½ in. long and clamped together by two 1½-in. bolts over a square-cut depression in the top end of the guide rod. The rod serves as a guide for the falling ram through the driving cap which takes the blow from the clamp weights.

In starting a hole the ramrod, without the clamp weights, was suspended close to the surface of the chat

and then carefully plumbed. A slight drop marked the plumb position. After setting the ram to one side a section of casing was set by hand around the mark in the chat. On the first two holes a factory shoe was used at the bottom of this first section, an adapter of 4-in. pipe being used between the shoe and the casing to jump the thread from the factory style on the shoe to the Rivermines thread on the casing. To the top of the casing was screwed another adapter and then a factory driving head. Upon this head a factory driving cap was set, it fitting loosely and having no threads. The clamp was next bolted to the ram, and the ram was then suspended over the casing and lowered to permit the guide rod to enter the hole in the driving cap. By regular intermittent pulling on the rope the operator then hammered the casing down into the chat, care being taken not to pull the ram up so high as to pull it entirely out of the cap which serves as a guide to the hammer fall as well as to receive the shock of the falling hammer clamp. Short blows were used on each section until the jointing of casing pipe passed below the collar of the hole and well into the chat. This was done to minimize the strain at the joints. After this stage the fall of the ram was increased to the maximum possible.

The first section of casing was driven almost without apparent resistance—the second and third almost as easily. Two or three sections were customarily driven before attempting to pump out the core, as it proved to be impossible to pump after driving only one section, as the top chat was too loosely packed and the casing hammered down in using the sand pump. When ready for pumping the driving ram was set aside and its rope's free end hitched to the reclining clamp to keep it out of the way and steady the rope block aloft. The driving cap was next removed from the casing and water put into the hole. Care was always taken to keep the ropes dry, as they gave a great deal of trouble when wet in handling them on the drum of the power winch. The operator then took two turns of the sand-pump rope over the winch drum and hoisted the sand pump and its jar stem, dropping them down through the casing slowly until they reached bottom. A short stroke was then used —only a foot or so—just enough to keep the top of the core-chat in agitation in the water. Ten to fifteen strokes usually sufficed to load the pump well, and it was then promptly hoisted out of the hole.

THE factory had recommended two sand pumps, so that one could be emptied while the other was being used in the hole. This would have required breaking of the threaded joint between the pump and the jar and the screwing on of the alternate pump for each hoisting. If this were to be done with the tools hanging vertically the rope would undergo severe wear in sliding around the drum under tension. So at first the practice was to tilt the string of tools over an ordinary wooden horse, and then to sluice the chat out of the pump cylinder into the proper container. This proved better than changing pumps, but the method was soon improved upon. A round bucket of ⅛-in. sheet iron for the sides and ¼-in. for the bottom was electrically welded. This was about 12 in. deep and the same in diameter. Through the center of the bottom a ¾-in. bolt was inserted, projecting upward about 3 in. The sand pump was lowered upon this bolt. The head of the bolt raised the ball valve in the sand pump, and by then jarring the pump up and down a number of times the contained water and chat flushed out into the pail. To guide the fall of the pump upon the bolt three prongs of ¼-in. round iron were welded to the bottom of the bucket, spaced equidistantly around the bolt as a center. Occasionally these prongs were used instead of the bolt in cleaning out the sand pump. After emptying the pump it was lowered into the hole and the chat in the bucket emptied into a carbide can. Chat recovered from each 5 ft. of drive was kept separate for assay.

Measurements of hole depth were made from the collar of the hole as zero with a marked line—a small rope with a wire interlacing it every 4 ft. Fractions of feet were read upon a rough scale marked upon the edge of the windbreak. Immediately after each drive of the casing a measurement was taken of the core standing in the casing. This distance subtracted from the total amount of casing in the "ground" showed the feet of core contained. With a greased finger a mark was then placed upon the sand-pump rope at the exact feet of core above the casing collar. Pumping then proceeded until this mark fell just below the collar. As a check on the feet of core pumped, another measurement was then taken before further driving. All measurements were tabulated as made, thus providing an accurate record of all operating conditions and data valuable in weighting the assays obtained from the samples.

UTILIZING carbide cans for containers completely solved the problem of handling samples, and at no cost, as plenty of them were available from the mines. All the chat and water from 5 ft. of core-chat pumpings filled up a can to about two-thirds of its depth. By several settlings and decantations absolutely no slime loss was entailed and practically all of the water was eliminated.

After pumping out core to the bottom of the casing the sand-pump string was set aside. A new section of casing was then screwed on, the adapter, head, and driving cap were adjusted, and the driving was renewed. On half of the holes the drives and pumps were 5 ft., and this resulted in a coring efficiency of 53.9 per cent (figured by direct lineal measurements). The drives were then shortened to two and one-half feet and the coring efficiency was increased to an average of 68.5 per cent.

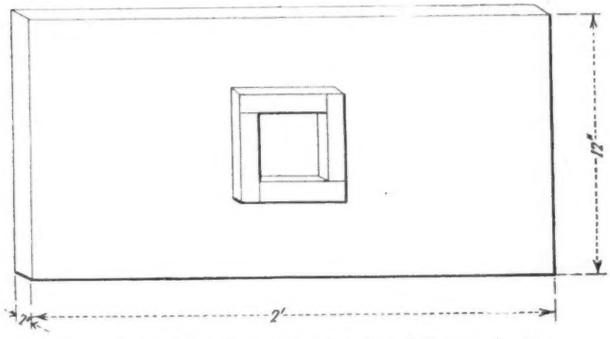
The holes bottomed on rock or clay. When on rock the casing displayed a decided rebound, and just before striking the rock it was noted that water in the hole had a tendency to seep away, making pumping of core difficult. When holes were bottoming in clay the first intimation appeared in pumping the core. In one instance the chat pile had overrun a slime pond, and at a depth of 45 ft. the casing entered a fine, sandy slime. In pumping out core the mixture of chat and slime became such as to get the sand pump stuck in the bottom section of casing. It then became necessary to pull casing, sand-pump string

Pulling casing

and all, threading off each section separately from the pump rope. This was tedious but successful, and after getting the bottom section of casing out on the surface it became possible, after some considerable effort, to work the pump free of the casing.

How Difficulties Met in Pulling Casing Were Overcome

As soon as a hole was bottomed moving began. Usually within an hour or so the rig was drilling on the next set-up while the two shovelers proceeded to recover the casing from the hole just completed. In the case of the first hole, which was 85 ft. deep, the pulling of the casing furnished an unlooked-for difficulty. The hole bottomed in clay, as was evidenced by some of it plug-



Board support for tripod poles (shown in the illustrations on pages 249 and 250)

ging up the sand pump. The factory jack was then set over the projecting casing, which ran up through the jackscrew. This jack is designed so that the casing can be locked tight to the hollow screw which works up through a plate supported on the jack's frame by turning of the casing pipe with chain tongs. The jack is powerful, and it was a surprise to meet trouble in this instance of pulling casing up through chat into which it had been easily driven.

FROM the first it was wellnigh impossible to turn the casing. It was thought, however, that if the casing were freed from the clay in which the hole had bottomed, reasonable progress would then be attained. It took several hours to raise the casing some 3 or 4 ft. Then a heavy iron bar was dropped down through the casing in an attempt to break the clay seal within the casing, but this failed. Three men worked all day with a net of but 13 ft. of pull. Then the theory developed that the steady turning around and around of the casing caused a continual brushing of fine chat from the hole all the way to the top and that this fine material wedged around the casing. Therefore it was decided to abandon the use of the factory jack, which would doubtless serve well in plastic or non-crumbly ground, but which was not giving entire satisfaction under the conditions described.

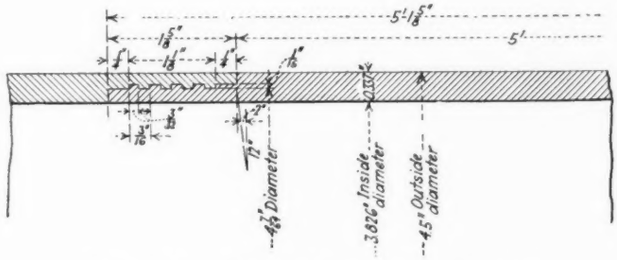
Two No. 4 crank jacks were then secured and placed under a clamp fastened to the projecting casing. In using these directly opposite to each other all casing movement was vertical, and wall disturbance, with its consequence of falling fines and packing, was reduced to a minimum. About 22 ft. was pulled with these jacks, and then the remainder of 50 ft. was literally "pumped" out in a few minutes by means of a steel rail for a pry pole, it being worked over a wooden horse through a loose-slipping loop of chain around the casing. Thereafter pulling casing required only a matter of minutes for any single hole. Usually only one crank jack was used to start the casing, it being used with the clamp loose on the casing, slipping down of its own weight each time that the jack was lowered. In breaking joints 36-in. chain tongs were used. The factory safety grip was always used while pulling casing to prevent it from slipping back into the hole. It was set upon a ¼-in. steel plate 3 ft. square, having a hole of 6-in. diameter in the center which fitted around the casing pipe. The plate gave the safety clamp the necessary support over the chat surface.

THE factory driving shoe was used only on the first two holes. In the second hole the casing broke 10 ft. off bottom with the hole 45 ft. down. This lost 10 ft. of casing, the driving shoe, and the thread adapter. In the next hole the broken section of casing from this second hole was used as a "shoe." It worked successfully, there being no need of heavy shoe protection in the chat. In case of loss by casing breakage there was a considerable saving, as one factory shoe cost as much as four sections of casing. The Rivermines casing developed weakness at the joints. Irregularities in the roundness of the 4-in. extra-heavy pipe left scant the body back of the threads, and though they were sufficiently strong for pulling they could not stand up long against the blows of the driving ram. In drilling 803 ft., twenty-nine sections (145 ft.) of pipe were lost. This imposed a charge against the drilling of approximately 18c. per foot.

The portable power winch worked satisfactorily, the only break in steady service being due to magneto trouble. It was easily moved. For an extended drilling campaign a clutch might advantageously be added, as the manila rope (¾-in.) developed a kinking tendency and would then catch itself on the drum, then wind up on itself and hoist the tools into the tip of the tripod, and then tip over the engine. This happened only once—when the operator failed to shut off the gas soon enough.

Cold weather furnished some troubles, but did not seriously interfere with drilling operations. Rain, however, caused them to stop, for as soon as the ropes got wet it was very dangerous to attempt to work them over the drum of the winch.

The total operating labor cost of this drilling was 61c. per foot and this included all moving from yard to the



Rivermines flush joint casing from 4-in. extra-heavy pipe

pile, up the pile, moving from hole to hole, pulling casing, moving back to town, and other incidental work, as well as time lost in the initial experimenting for best procedures. The actual labor cost per foot after the methods were standardized and the men acquainted with

the equipment was 34c., including drilling, moving, pulling casing, and transport of samples to laboratory.

In conclusion the tabular record of one hole is given:

Record of Hole No. 12

Started drilling Jan. 10, 1927, 12.30 *p.m.* *Bottomed* Jan. 11, 1927, 1.30 *p.m.*

Casing Depth	Core After Drive	Core After Pumping	Core Made	Core Pumped	Sample No.	Assay, Per Cent Pb
5	1.8	....	1.8	0.0	....	....
10	3.7	0.1	1.9	3.6	129	0.80
12½	2.0	0.5	1.9	1.5	....	....
15	2.1	0.4	1.6	1.7	130	0.83
17½	2.4	0.1	2.0	2.3	....	....
20	1.8	0.3	1.7	1.5	131	0.68
22½	2.3	0.2	2.0	2.1	....	....
25	1.7	0.4	1.5	1.3	132	0.75
27½	2.2	0.2	1.8	2.0	....	....
30	1.7	0.3	1.5	1.4	133	0.73
32½	2.5	0.5	2.2	2.0	....	....
35	2.2	0.5	1.7	1.7	134	0.67
37½	2.9	0.4	2.4	2.5	....	....
40	2.8	0.3	2.4	2.5	135	0.53
42½	2.4	0.3	2.1	2.1	....	....
45	2.3	0.3	2.0	2.0	136	0.45
47½	2.2	0.3	1.9	1.9	....	....
50	2.1	0.3	1.8	1.8	137	0.41
52½	2.7	0.2	2.4	2.5	....	....
55	2.3	0.3	2.1	2.0	138	0.53
57½	2.7	0.5	2.4	2.2	....	....
60	2.5	0.6	2.0	1.9	139	0.54
62½	2.4	0.7	1.8	1.7	....	....
65	2.7	0.6	2.0	2.1	140	0.55
65-Rock						
			46.9	46.3		

46.9/65—72.2 per cent coring efficiency.
No casing lost.
Average-arithmetical assay, 0.62 per cent lead.
Weighted average assay, 0.60 per cent lead.

Cornwall Tests New Tin Metallurgy

A NEW PROCESS for the recovery of tin has been the subject of recent investigations in Cornwall. The process is designed for the extraction of tin from slime carrying upwards of 10 per cent tin oxide. The slime is subjected to a chloridizing roast converting the oxide to chloride and subsequent electrolysis of the tin chloride solution. A small experimental plant has been in operation on the premises of the Geevor mine, but results have been kept secret. It is understood that those responsible are particularly averse to publishing results until such time as they feel that they have perfected a process of definite practical utility.

Copper Forty-one Years Ago

ONE of the principal concerns of mining men is the price of metals. One is likely to think about his own times more acutely, and to base his state of mind upon the momentary situation, without realizing that prices are relative and that through technical and mechanical improvements operating margins are being improved, but that this improvement is not so obvious to all or as immediately responsive as the rise or fall in the metal price. That the mining man of long ago was concerned in the same problems and similar price situations as exist today is shown in the following interesting excerpt from a correspondent's letter to the *Engineering and Mining Journal* in 1886:

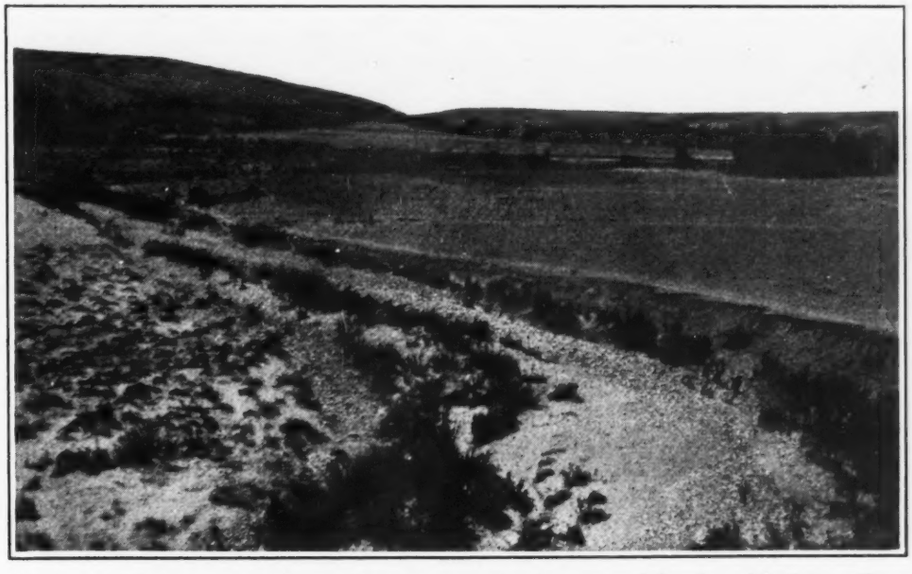
In the Boston *Commercial Bulletin* I read that the Calumet & Hecla can make a handsome profit by selling its copper at 10c., while producing it at a cost of 7, and also that Arizona and Montana producers will be compelled to close if 10c. remains the price and the market be left to the Calumet & Hecla and those Lake companies that can stand this price.

I am not in a position to speak for the Arizona producers, but as far as Montana—that is, Butte—is concerned, being conversant with the capacity of Montana producers since the first copper was shipped from here, and having been since then a close observer, I might perhaps be able to destroy this comfortable, though false, impression held apparently by the managers of the Lake concerns and by other parties interested in the copper trade.

The Calumet & Hecla may perhaps compel the Parrot Co., with its smaller ore reserves, and but one mine 800 ft. long by 150 ft. wide, to close down by reducing the price of copper to 9 or even 8c., if the shareholders will allow it. But such concerns as the Anaconda or Montana Copper Co. could not be compelled to close, even by reducing the price to less than 8c.

The Anaconda will soon be in a position, by strict economy and after completion of its new concentrating mill—which in itself is a wonder of the age, the largest in the world, and provided with the latest automatic appliances—to reduce the labor charges and to compete in the cost of producing copper with any concern in the world. At the same time, the Anaconda will be able to double its production, if forced to do so by the further reductions of the price of copper.

It is almost a certainty that the orebodies in sight at the Anaconda & St. Lawrence mine warrant the same production for five, or perhaps—if the 1,000-ft. level continues to show as large an orebody as at present—for ten years to come. Besides, this concern could fall back on the other copper mines, indirectly controlled by it, such as Modoc, Mat, Adelaide, Wake-up-Jim, Green Mountain, and many others. Most of them carry silver, and it is only a question of time when they will be prepared to desilverize on a large scale in this country, instead of allowing the English smelters to get the profits on the work.



Valley of the Trancas River, Guanajuato, showing gravel banks with Santa Rosa Mountain Range in background

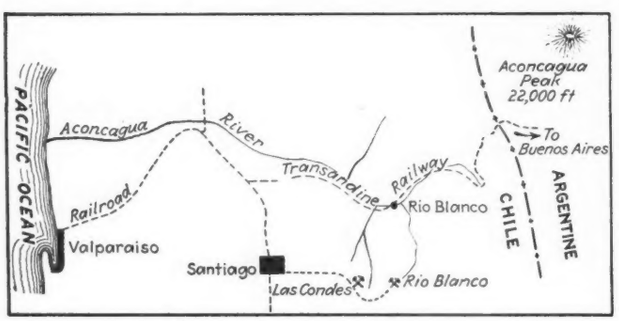
The Copper District of Las Condes, Chile

A Probable New Low-Grade Camp

By LESTER W. STRAUSS
Consulting Engineer, New York City

THE mineral distribution of South America might be considered capricious, as to its occurrence in the various countries within the bounds of that continent. Although Paraguay and Uruguay have no mineral production that is worthy of mention, the remaining countries have become attractive to the mining man: Argentine with its oil output, with lesser economic value in lead and still less in copper; Brazil for gold, diamonds, and, in smaller degree, iron and manganese ores; the Guianas for gold; Venezuela for oil and iron ore; Colombia for platinum, gold, oil, and emeralds; Ecuador for oil and gold; Peru for copper, silver, oil, vanadium, and coal for local consumption (in the interior); Bolivia for tin, silver, copper, antimony, wolfram, and, to a minor extent, bismuth. Here oil developments also are under way. Chile produces nitrates, copper, iron, and coal (the last named for consumption within the country), and has possibilities of oil shale and oil production later. In the above review, only Chile and Peru are important as regards copper production, the former's yearly output being greatly in excess of that of Peru, owing to the activities of the Chuquicamata, Braden, and Potrerillos camps—all extensive low-grade deposits—whereas Peru has only Cerro de Pasco (and its affiliations) and Northern Peru Mining Co.'s output. There are expectations that a fourth low-grade property will some day be included in Chile's list; hence the following description of the region may be timely.

Lester W. Strauss



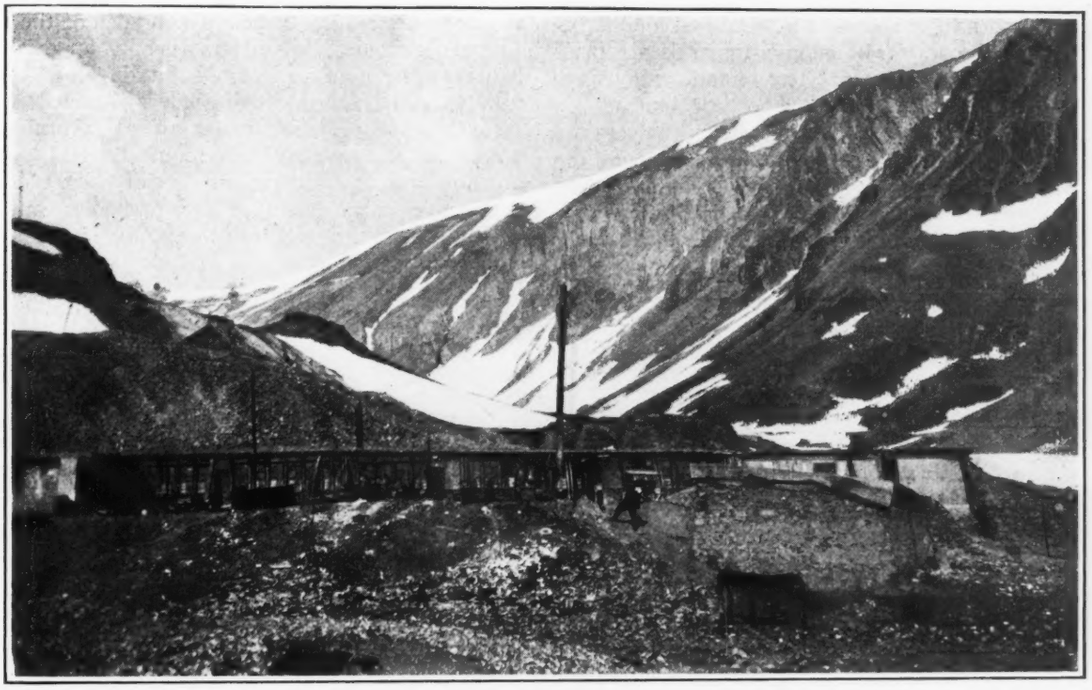
Sketch map showing situation of Las Condes and Rio Blanco

LAS CONDES district was first known in 1840, and exploitation began in 1865. It lies some 40 miles (56 kilometers), by wagon road, east of Santiago, the charming capital of Chile. The San Agustin property was the first one to produce mineral of shipping grade, varying from 25 to 30 per cent copper, with low gold and silver contents. This was packed on mules into Santiago until later years, when the cart road, that now serves for automobile traffic, was built. At present there are two operating companies—Comunidad Minera Elguin and Compania Minera Disputada, and a third but inactive company, Compania Minera Las Condes, all three on the Mapocho River watershed. Over the dividing crest and on the Rio Blanco watershed (tributary to the Aconcagua River) are the Rio Blanco Copper Corporation (a Delaware, U. S. A., corporation operating as the Compania Minera Rio Blanco, Ltda., in Chile); Compania Minera Los Bronces de Rio Blanco and the Compania Minera El Bronce de Rio Blanco; and some 20 kilometers down stream, the Compania Minera Cristobal Colon, which, although not similar in its type of copper mineralization to the other properties mentioned, is a producing concern.

Las Condes lies in the high Andean Cordillera at the head of the Mapocho River, the camp of the Compania Minera Disputada being at 3,460 meters (11,250 ft.) and the crest of 4,000 meters (13,100 ft.) elevation above sea level. The present camp of Rio Blanco is at the former level. During the winter months, from April to November, it is not uncommon to have heavy snowfalls—in parts as much as 30 ft.—interfere with means of transportation to the properties, for which occasions arrangements exist for the proper housing and food supplies for staff and man, so that during such times development work can be carried on, though no traffic might be possible. It does not necessarily follow that every winter is severe as regards snowfalls, but the weather will be cold. During the months from December to April climatic conditions are usually agreeable. The trip in automobile, during this dry period, can be made in less than four hours from the Plaza de Armas, in Santiago. In regard to foodstuffs, the Las Condes camp is supplied from Santiago and the Rio Blanco camp draws on San-

The Andean Cordillera Copper Region

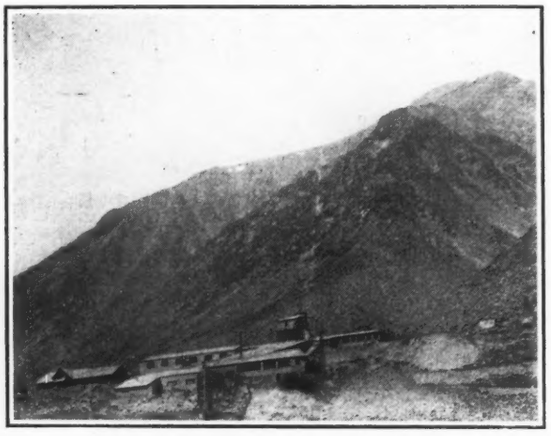
San Agustin staff quarters



Rio Blanco camp, 1927. High ridge in center is rhyolite Below and to the left is a mineralized mass

tiago, as well as the region in the warmer climate downstream, for greenstuffs and fruits.

The Las Condes region is made up entirely of eruptive rocks (volcanic flows), which have been classified as andesites, diorite porphyry, rhyolite (referred to locally as liparite), granitic, also dioritic, types, and a tourmalinized breccia. It is not the object of the present article to enter into a geological discussion or description other than to mention the type rocks and mineral occurrences. Chalcopyrite is the economic mineral, with which occur pyrite and a little specularite; a limited amount of copper sulphate occurs. The gangue minerals are principally tourmaline and quartz. The mineralizations are found as irregularly distributed shoots or bunches (a plum pudding occurrence) of fairly clean chalcopyrite or as disseminations in the tourmaline breccia around the shoots as well as away from them (Disputada-Elguin types), or disseminated in andesite that grades into dioritic porphyry, as exemplified in the mineralized mass that is being developed by the Rio Blanco Copper Cor-



Front view of Disputada mill

poration. No important evidences of secondary enrichment have been encountered in the course of development operations up to this time.

At present only two companies are operating productively—Compania Minera Disputada and Comunidad Minera Elguin. As the shoots of high-grade mineral become less abundant, the former company decided on a flotation mill for the low-grade (3.5 per cent) copper mineral. Operations began in 1923 and have proved successful. The adaptability of the mineralization to flotation and the development of hydro-electric power were factors that favored efficient and cheap treatment. A weak feature of the scheme was the light tramline that connects the mine with the mill. The Comunidad Elguin ships high-grade mineral, over 18 per cent copper, and has recently begun producing concentrate from a gravity mill.

OPEN stopes are the rule and mining operations present no difficulties, as the ore breaks favorably and the wall rocks stand firmly. In the Disputada property, only the low-grade mineralization is being exploited. The horizontal sections of the stopes, on the present mining scheme, vary up to 30x30 meters, with vertical height, to date, of 20 meters. The stopes of the high-grade shoots are usually from 10 to 20 meters in diameter (being roughly elliptical in section). Vertical height may reach 50 meters. These shoots seem to occur at the junction of several fractures, the mineralized solutions having replaced the crushed country rock. The Elguin operations include the delivery of part of the surface dumps and certain old fills to the Disputada mill. Development of the low-grade mineralization, similar to that partly opened up in the adjoining Disputada ground, has up to the present been casual and incidental to prospecting for the high-grade shoots. A mutual development campaign and operating arrangement as regards the low-grade orebody would appear to be advantageous to both companies. Of the various crosscut tunnels, two reach the mineralized zone. The branch of the lower one (Perez—altitude 3,460 meters) is only for the Disputada haulage; the upper (Union—altitude 3,550 meters) is used as outlet for the high-grade ore mined in the San Agustin mine. These tunnels afford favorable starting points for the intensive development work. No shafts are now used for operations, but at a later date shafts will be essential to open up orebodies or potential values in depth, in addition to any exploration that may have been carried on by diamond drilling.

On the Perez level a shaft was started but stopped at a depth of 11 meters (36 ft.). In April, 1926, it was full of water. The Perez level, in Disputada ground, is connected with the Pommerantz crosscut which serves as the main haulageway from the ore chutes to the aërial tramline. The principal stopes are on the higher (Union) level. Broken ore is dropped to the lower level and trammed out by electric locomotives—the length of haul being 1,500 meters (4,920 ft.). No sorting is attempted, the stoping ceasing as soon as the rock falls below 2 per cent copper content.

Jackhammers are used in mining and development work. In the San Agustin mine the present stoping consists of breaking down the rich bunches and stripping ore above 10 per cent copper, where such has been left as pillars from previous operations. All the drilling is by hand. Rough sorting is done in the stopes, the resultant product being hauled from levels Nos. 2 and 3 up an incline plane to the Union level (No. 1) and trammed out to the surface for more careful sorting into a shipping product (18 to 20 per cent copper). The rejects from the latter operation form a stockpile for the water-concentration plant. During the winter months all the sorting is done underground and the product accumulated there until transportation to Santiago is again possible.

THE Perez crosscut passes through the San Agustin claim and is connected, through a roadway, with the lowest (No. 3) level, which is 15 meters above. No arrangement has been arrived at whereby the San Agustin could use this for transport of its ore and thereby be afforded convenient means of exploration. A third crosscut—Encantada—roughly parallels the Perez, and is located in the ground of the Compania Minera Las Condes; it lies some 500 meters to the north and a few meters above. The crosscut was started years ago and still requires several hundred meters of driving to reach the Elguin claims. In 1923 (?) a spur was driven (from what was then the face) to reach the Transite shaft of the Compania Minera Las Condes, at the same time the main heading was being advanced toward San Agustin; but work was afterward suspended because of misunderstandings. The Encantada level would give the San Agustin mine an independent exit, if so desired. The Comunidad Elguin does not control the tunnel rights and a working agreement might be made with the Compania Las Condes. The sorted ore at the Union level is hauled in carts (six mules) to a point some 20

kilometers downstream, and past the mill of the Compania Disputada, where transfer is made to ox carts, the haul continuing into Santiago. The average yearly production, within recent years, has varied from 3,500 to 4,000 metric tons.

AT THE head end of the Disputada tramline the ore is passed to a crusher and reduced to 2-in. size; there is storage capacity for 900 tons at this point. The tramline is a Pohlig installation, 6,550 meters (21,490 ft.) long, with a vertical drop of 800 meters (2,625 ft.). A 60-hp. electric motor is required to start movement of the line, as the first section is uphill haul. Although the rated capacity of the line (carrying cable 32 mm., or 1.32 in., and unloaded cable 23 mm,, or 0.92 in.) is 38 tons per hour, the safe working rate is 24 tons at a speed of 2.43 meters (8 ft.) per second. The actual number of buckets on the line was 110, with capacity of 350 kilos (770 lb.) each. The line was purchased at a low figure; consequently the towers, among other details, were too light to resist the slides that occur when the snow melts: such accidents have resulted in costly mill shutdowns. Where the line passes over the crest, an artificial tunnel has been built for protection. At the discharge end there are arrangements for the accumulation of ore in stockpiles; there is a 300-ton bin, in the mill proper.

THE treatment of the low-grade mineral has been eminently successful, owing to the results of the Minerals Separation plant erected at Fierro Carrera. It was estimated that the daily mill capacity would be 250 tons; at times nearly 400 tons has been milled, but the normal average is 350. The installation consists of one set of 36-in. x 16-in. rolls; two 6-ft. x 16-ft. Allis-Chalmers ball granulators working in conjunction with two 4-ft. 6-in. x 16-ft. Duplex Dorr classifiers, followed by one six-compartment, M. S. Standard machine (with 1 ft. 6-in. propellers). The concentrates pass to a three-compartment, M. S., sub-aërated machine, the concentrate from which drops to a 30x10½-ft. Dorr thickener. From this it passes to one 8-ft. x 8-ft. Oliver filter, and thence to a 12-ft. x 24-ft. Lowden oil-fired drier. Tailing from the three-compartment machine is returned to the Dorr duplex classifiers. Middlings from the six-compartment machine pass to a four-compartment M. S. sub-aëration machine, the concentrate from this being returned to the head of the six-compartment unit. The tailing passes out of the mill and down to a three-compartment cascade machine and then to a tailing pond, where measures are taken to clarify the solutions so as to avoid river pollution. The average mill recovery is 90 per cent, although this figure is sometimes bettered. Tailing averages 0.3 per cent copper: this figure has lately been lowered by the use of xanthate. The concentrates vary from 22 per cent to 24 per cent copper. Gold and silver contents are negligible. The average ratio of concentration is 7 to 1. Monthly output, if the mill runs continuously, is from 1,200 to 1,500 tons of concentrates. The feed and tailing are automatically sampled, and the concentrates are hand-sampled. The electric motors consume about 340 hp. The plant arrangement is simple and of the "hillside" type. Construction has been efficient. There is a fairly well-equipped machine shop.

In addition to this modern mill of the Cia. Minera Disputada is the recent effort on the part of the Comunidad Elguin to raise the grade of the dump material, which is the reject of the mineral sorted at the Union level. The plant began operations early in March. The mill is a "hillside" type, the installation consisting of two jaw crushers and a set of small rolls. The crushed material passes through three trommels which make four products: plus 7 mm. (0.28 in.), 5 to 7 mm. (0.2 in. to 0.28 in.), 3 to 5 min. (0.12 in. to 0.2 in.), and minus 3 mm. (0.12 in.). The first size passes to a three-compartment jig and the remaining three classes are each treated in two-compartment jigs. When a sufficient quantity of tailing has been accumulated, it is reground for treatment by flotation. The capacity of the plant varies between 80 to 90 tons per twenty-four hours. The grade of concentrate is expected to average 19 per cent copper or better, and the degree of concentration will be about 2.5 to 1. The mill is electrically driven and power consumption was estimated at 100 hp. Comunidad possesses two hydro-electric plants, with a total capacity of 370 kilowatts.

TOTAL tonnage of high-grade mineral products shipped from the producing mines, from 1925 to March, 1927, was, as nearly as can be estimated, 300,000 tons averaging 22.0 per cent copper, the gold and silver contents being negligible. Disputada mill probably treated, up to April 1, 1927, 200,000 tons of ore, producing 27,000 tons of concentrates of 22 per cent copper contents. The region can be credited with over 70,000 tons of fine copper, the greater part having been delivered to the Naltagua and Chagres smelters, in Central Chile. At one time local smelting, on a small scale, was attempted at a place some 15 miles downstream from Las Condes, and also at La Puerta de Las Condes.

In view of the high cost of cart freightage, and the desire to be independent of the whims of the freighters, an aërial tramline was erected between the Disputada

American Camp, Cia. Minera Aconcagua, 1923

mill, at Fierro Carrera, and La Puerta de Las Condes, which is a point 18 kilometers (11.0 miles) over flat country from Santiago. The line, which is by Bleichert, is 24,000 meters (15 miles) long, with a vertical drop of 1,785 meters (5,855 ft.). Its capacity is 10 tons per hour and 0.75 tons up-freight at a speed of 2.8 meters (9.2 ft.) per second. The carrying cable is 26 mm. (1.28 in.) and the up-cable 23 mm. (1.12 in.). There are 255 buckets, with a capacity of 200 kilos (440 lb.) each. Power is required to start the line at the loading station and is supplied by a 65-hp. motor to drive the first two sections, and a 40-hp. Diesel engine at the unloading station drives the third section. To date the material handled has been exclusively that of the Disputada company, which decided to build the tram.

On the road between La Puerta de Las Condes and Fierro Carrera, the Disputada company has installed two hydro-electric plants. Pelton-type waterwheels operating under 176 and 140 meters (577 and 459 ft.) head develop 990 and 750 kilowatts respectively. The tailrace from the first-mentioned station feeds the canal that goes to the second plant. As the company has an excess of power, arrangements have been made to satisfy the requirements of the Rio Blanco Copper Corporation.

The above descriptions cover the operations of the producing companies. At present the Compania Minera Las Condes, formed in 1923 and later amalgamated with adjoining interests, is inactive. A production of 200 tons of sorted ore, containing 16 per cent copper, resulted from mining a high-grade shoot in the Transite shaft. The company has passed through an interesting episode in regard to its finances. Technical advice recommended the completion of a hydro-electric plant on the Rio Blanco River, some 11 kilometers (7 miles) from the Encantada crosscut tunnel, so that mechanical drilling could be employed to hurry the development work. The location of the plant was ill-advised, and the money expended, nearly $200,000 U. S. currency, is bringing in no return—and may never do so. The power house was destroyed by a snowslide. Fortunately, no machinery had been hauled in. The canal consisted of reinforced concrete pipe, as rock excavation would have been too costly. The company is now without capital to carry on essential exploration, of which a very limited amount had been done: This development comprises some thirty drifts, one 100 meters long, another of 50 meters, and the remainder from 10 to 35 meters; the Transite shaft, sunk to a depth of 90 meters, and three levels totaling 200 meters. The bottom of the shaft is 50 meters above the Encantada crosscut, and the two lower levels are said to be in a zone of disseminated mineralization carrying from 2 to 4 per cent copper. At present the workings are under water. The surface showings, where the thirty drifts have been driven, are a weathered tourmaline breccia with copper sulphates appearing in "spots." Dumps at these workings show sulphide mineralization, mainly pyrite.

THE three companies on the Rio Blanco side of Las Condes were formed some five years ago. A limited amount of development work was carried on, but it has not been productive, to date only low-grade mineralization having been encountered. The "El Bronce" property has done the least work and is idle at present. "Los Bronces" has on the payroll eleven men, employed on a small amount of exploration work. Cia. Minera Rio Blanco acquired the claims and water rights of Cia. Minera Aconcagua in April, 1925. The last-named company, starting from two crosscuts, had driven several hundred meters of workings in the mineralized andesite and had sunk numerous shallow pits. Aconcagua's engineer sampled these workings, and the company then decided to interest capital in the United States in view of the tonnage estimated as available—namely, 4,000,000 tons containing 3 to 4 per cent copper. In March, 1923, the property was re-examined, and check sampling disclosed copper content of 2.1 per cent and 1,600,000 tons of ore: rather lower figures than those of the original estimate but still sufficiently interesting. In 1924 capital was obtained for the financing of the development work, and in the following January operations were begun. To date ten entries have been opened up, and drifts and raises driven off them. Three diamond-drill holes have been put down, the deepest of which is said to be below the level of the camp. The diamond drilling was done, under contract, by the Sullivan Machinery Co. In 1926, a 225-hp. compressor (1,000 cu.ft. capacity) was installed, so that development work could be speeded up. It has been stated that up to the present time close to $500,000 U. S. currency has been spent. Proper reticence as regards tonnage figures has been observed, but it is evident that a large tonnage of commercial ore must be visible before any heavy outlay of capital will be made. A survey for a railroad has been run down the Rio Blanco valley to the station of that name, on the Transandine Railroad, which passes over into the Argentine. Rio Blanco is 170 kilometers (106 miles) from the port of Valparaiso. The line surveyed might involve about 30 kilometers (19 miles) of development and would necessarily start below the limit of the usual snowfall. This would be a shorter route than a line which has been reconnoitred to La Puerta de Las Condes; but this latter would mean possibly 50 kilometers plus 18 kilometers of flat country in the Santiago valley, or a total of 43 miles. Although this construction would be more expensive, it would result in cheaper freight rates to the coast. The Transandine line between Los Andes and Juncal is electrically operated; consequently power could probably be purchased from the supplying company—"Compania Nacional de Fuerza"—until such time as the Cia. Minera Rio Blanco decides upon building its own power plant.

The foregoing descriptions might be suggestive of another large low-grade deposit, a probable fourth to Chile's three low-grade properties. Ore from this district should be amenable to flotation, and the possibility of encountering some of the high-grade shoots similar to those that were the early basis of the Disputada and Elguin operations is interesting.

Copper production of Chile in the past is of interest. The accompanying data were obtained from an article by F. Benitz—"A History of Mining in Chile"—that appeared in the *Mining Magazine* (London) in November, 1921.

Chile's Copper Production

Period	Metric Tons	Number of Years	Tons per Year
1600–1699	4,600	100	46
1700–1799	62,200	100	622
1800–1899	1,764,680	100	17,646
1900–1917	850,720 (in 1917–102,527)	18	47,260
1918–1926	1,260,000 (in 1926–192,000)	9	140,000
	3,942,200	327	

European Zinc Smelters Are Reducing Coal Consumption

IT SEEMS probable that considerable progress is still being made by European zinc smelters in reducing coal consumption. In the old direct-fired furnaces coal consumption used to be 180 to 200 per cent of the zinc-bearing material charged to the pots. Modern practice at one Belgian works is 100 per cent, and at one English plant improved furnace design has reduced coal consumption to 85 per cent of the zinc-bearing material charged. At favorably situated works coal is to be had at 17s. a ton; coal handling, firing, and ash removal cost 10s. per ton of coal used. Consequently a reduction in coal consumption from 100 to 85 per cent of zinc-bearing charge means a saving of 8s. per ton of zinc produced.

DISCUSSION

Handling Sticky Ores on the Comstock

THE EDITOR:

Sir—Mr. Baker's article, in your issue of June 25, on handling sticky ores on the Comstock Lode is of much interest to me, as I designed the lowering skip plants used in the United Comstock mine. Perhaps some further notes regarding them will be of interest to others.

The first installation, from the Yellow Jacket tunnel level down to the main haulage adit, about 600 ft., was a rush job to meet an emergency that had not been foreseen—namely, that the ore was too sticky to be handled by gravity in any of the usual ways. It was decided to lower the ore in ten-ton skips, using a two-compartment raise then under construction, at a slope of about 70 deg. I believe that Mr. John Rigard, then mine superintendent, first suggested this method. Mr. R. A. Hardy, manager, placed the design of plant in my hands early in January, 1923. The equipment was designed and installed and went into operation the latter part of March.

Acquaintance with the ore during the three months that the mill had been operating caused me to believe that it could not be trusted to dump from a skip that had to be inverted to reach the dumping position, nor through a door in the bottom of the skip if the skip and contents were substantially at rest when the door opened. But it seemed that if skips were made cylindrical and tapered so as to be wider at the bottom than at the top, with bottom doors giving unobstructed opening of the full diameter of the large end, and, finally but most important, that if when the skip came to a stop at the bottom, the ore should keep right on going, there was every probability that the ore would dump.

These ideas were embodied in the installation, and after the operators became expert in handling the skips there was no further trouble in lowering all the ore the mine could produce. My recollection is that 2,600 tons in one day (three shifts) was the maximum output during that summer. This, however, was not the maximum capacity of the lowering plant.

The skips each had a cast-steel horn riveted to the bottom of the cylindrical shell, which engaged at the bottom of the trip with a similar horn forming a landing chair, which in turn was mounted on a spring frame, permitting a movement of a foot or so, while absorbing the shock of landing the skip. It took quite a jar to loosen the ore and make it discharge, so the punishment suffered by the landing device was severe, but for the five or six months during which it was under my observation it gave no serious trouble.

The landing device was purposely constructed so that some bolts would shear and release the landing horn if struck too hard for the spring to absorb the shock. My recollection is that new shear bolts had to be put in every month or two.

Mr. Baker's suggestion that arc gates in the bottoms of skips might have been better was one of the many details that we considered and gave up for the reason that it was less simple than the doors used, and also that the ore, dropping 13 to 15 ft. from the lips of the loading chutes to the bottom of the skips, would soon batter an arc gate so badly out of shape that it would cease to function as such.

The cost of this plant (not including the shaft, which was driven for another purpose) was between $9,000 and $10,000 or not much in excess of Mr. Baker's 20-in. pipe of about the same length, and less than his cost, if his first replacement is considered.

The satisfactory operation of the skips made the management decide to install a similar plant with seven-ton skips at the next level below. As the shaft was vertical, the problem was somewhat simpler. These are the skips illustrated by Mr. Baker in your June 25 issue, with pneumatic-ram landing gear instead of the spring shock absorbers. This equipment was purchased and delivered but not installed when I left the Comstock. As stated by Mr. Baker, two old Whiting hoist sheaves were to be used as "bull wheels." Without the sheaves this equipment cost about $7,500 and was approximately of the same length of trip as Mr. Baker's shorter pipe line.

Mr. Baker states that "it is believed that white-iron pipe properly cast and laid and costing not over $8,500 installed would have handled at least 250,000 tons of ore." Assuming these estimates to be correct, the installation cost becomes $0.034 per ton for a drop of about 570 ft., or practically the same drop as the first United Comstock skip plant. The latter cost in round numbers $10,000 for 754,893 tons (assuming that his figures apply to that installation only), an installation charge of $0.0133 per ton, and, so far as I know, the skip plant had not worn out at the time the mine ceased to operate.

If it took both of the skip plants to handle the 754,893 tons of ore mentioned, the initial cost of installation would be about $17,500, or $0.0232 per ton, but the useful life still remaining (or the salvage value in this case) was presumably greater, and the cost of the two skipways would have to be compared to the two lines of pipe, one to the 237 level and one to the 365 level, probably costing about $6,500, or about $15,000 for the two lines. It is to be regretted that the actual operating cost of the pipe lines is not available, for one would expect the labor saved, compared with skips, to be considerable.

The point I wish to make in the above comparisons of cost is to call attention to the economy of skips for this purpose. About one-half the labor cost at the United Comstock (during my time) was due to the sticky ore. Each skip runner had a helper and the two of them had to work hard to get the ore out of the loading packets and into the skips. With ordinary ore the runner could

have loaded without help. All gates were controlled by air.

Considering the upkeep cost of bulkheads, and time lost and dangers incurred in working gravity passes, there are many situations where skips might be more economical.

In connection with pipes for the purpose, would not rubber-lined wrought-steel pipes be worthy of thought? The abrasion might not be greater than occurs in rubber-lined ball and tube mills, and the cost of a small plant to reline and vulcanize a section at a time would not be prohibitive. B. P. LITTLE.

San Francisco.

* * * *

High Prices for Rock-Drill Parts

THE EDITOR:

Sir—Your editorial in the May 28 issue, "Spare Parts for Rock Drills," is cause for amazement. You seem to champion the cause of an anachronistic group in American industry. When the watchword of that industry is quantity production at prices that make able manufacturers benefactors, the manufacturers of rock drills seem to stand rigidly for the generally outworn price policy of "what the traffic will bear."

That service should govern, rather than price, is obvious. Possibly certain parts of high-duty drills are bought at some peril from others than the makers of the drills, but the price policies of some of the major manufacturers are illustrated in items that do not call for magnificent laboratory or other equipment. Note these comparisons of invoices:

	A Major Manufacturer	A Small Competitor
1-in. hose clamps	$ .55	$ .30
¾-in. hose clamps	.45	.26
Drill column, complete	84.00	58.00

You may be interested to know that the side rods of rock drills, weighing somewhat less than 3 lb., are sold at $2.20 each. They are ⅝-in. bolts, of good grade steel, to be sure, but they are not of a gold alloy.

You speak of the great investment in plant and research; but what is it for, if not to improve and *cheapen* the product! It seems obvious that the great capital in use, with consequent perfection of plants, puts the great manufacturers in position to eliminate the small competition, and really serve the mining industry. The larger mines, with good shops, can and do wisely make many parts. The smaller mines properly scan the horizon for sources of drill equipment at prices that they can afford to pay. That the competition noted is "causing concern to rock-drill manufacturers" is excellent news. A MINER.

Denver, June 13, 1927.

[The editorial in question seems to us to state the case fairly and to call for equitable treatment for the rock-drill manufacturer, whether he be small or large. Certainly it will be admitted that a manufacturer who has developed and successfully marketed a rock drill is entitled to as much secondary business in spare parts as he can get, and if he does not get this business he will necessarily have to increase his prices to correspond. It would appear to us that, as a logical outcome, if all rock-drill manufacturers were denied spare-parts business, the mining industry would have to pay a considerably greater amount for rock drills. It is well known that competition among the seven or more rock-drill manufacturers is very keen. Distribution is over a wide territory and individual sales are usually scattering. Necessarily, the relatively large number of such manufacturers has increased the first cost of rock drills under these severe marketing conditions. We think that the mining industry is very lucky to have so many manufacturers and so wide a variety of rock drills to satisfy its requirements, and we hope that all of these manufacturers will prosper.

The purveyor of imitations is in a dubious position, for he is taking advantage of the good will and the market established by others at considerable outlay in brains and money.

As to the "extortionate prices." Very likely some would agree with the writer of the foregoing letter. But marketing spare parts has its difficulties. In many respects it is a retail business. Various stores have to be established at different points and a relatively large stock of parts must be carried. Taxes have to be paid, and labor, and a variety of expenses. All pile up. Mass production at a central plant is the only thing that keeps these prices down to what the writer of this letter terms extortionate prices. So far as the items upon which the letter quotes prices are concerned, none have to do with spare parts at all—they are supplies, and, in the case of the drill column, equipment. Bolts are not a highly specialized part.

In our editorial there is nothing to suggest that where a mine is well equipped and where the machinists are sufficiently skilled the management should not do as it sees fit. The smaller mines can also do as they see fit.

Our editorial was written in the interest of fair play, and it seems to us that the letter in question agrees generally with the editorial but that the price element is the "hard point." Prices of a number of commodities are high and may be attributed to the high cost of distribution, which affects to a greater extent more highly specialized products narrowly sold than it does staples widely used.—THE EDITOR.]

* * * *

Pumping at Rio Tinto

THE EDITOR:

Sir—As to the manner in which the slaves operated the water-lifting wheels at Rio Tinto (*E.&M.J.*, July 2, page 15) I got the impression, when I visited that mine last November, that certain iron rings, which had been found in proximity to the wheels, were supposed to have been placed over their heads onto the shoulders of the slaves to give them the necessary weight to overbalance the water in the buckets upon the opposite side of the wheel. R. C. CANBY.

Wallingford, Conn.

* * * *

An Appreciation

THE EDITOR:

Sir—I wish to express my appreciation of your publishing such a long and detailed article on "A. R. Wilfley, A Mechanical Genius." This personal estimate of the man by one who knew him, Victor G. Hills, really made it possible to understand Wilfley and his work. In some writing that I have been doing for the new Dictionary of American Biography, I have found, upon looking up obituary articles, that *E.&M.J.* excels many other engineering periodicals in printing satisfactory appreciations of leading figures in the profession.

New York University. P. B. MCDONALD.

NEWS OF THE WEEK

Summary

BUREAU OF MINES tries out six electrical methods of prospecting at its proving ground near Boulder, Colo. Offers of co-operation and exchange of data are received from private interests.

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New gold discoveries cause rush to Rainbow Lake, in the Red Lake district of Ontario. Airplane companies operating into the district are "swamped" with requests for transportation.

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Mining chambers throughout Mexico and individual groups continue to oppose the recent decree of the president taking the management of labor troubles out of the hands of the state authorities.

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Portugal issues a decree affecting recruiting of Mozambique natives for work in Rand gold mines. Concern over the measure is expressed by the Transvaal chamber of mines.

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Opening of 800 miles of automobile road in the Peninsula of Lower California is expected to lead to the revival of mining operations in the Peninsula.

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Another mill burns in the Joplin-Miami district. Fire of unknown origin destroys the Empire Development Co.'s mill.

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Recent delevopments on lease workings revive interest in the Divide district of Nevada.

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Ore production in Utah shows an appreciable decrease for the first six months of 1927.

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Combined Metals company at Pioche, Nev., reduces operating force owing to the low price of lead.

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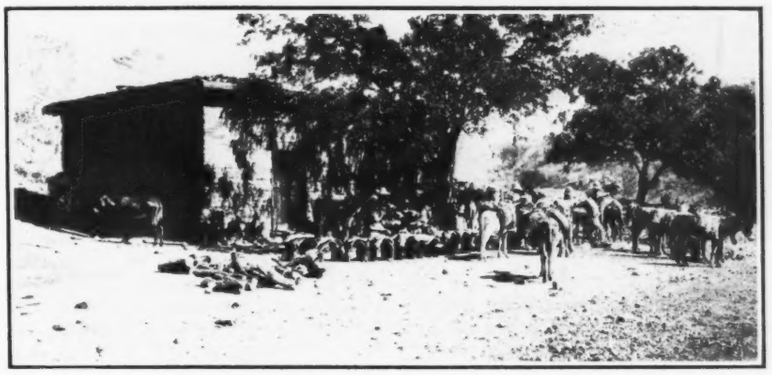
Calumet & Hecla Consolidated plans to add another large furnace to its smelting plant at Hubbell, Mich.



Shipping concentrates by burros at Las Animas mine

Many Sonora and Sinaloa Properties Undergoing Improvements

Mill Changes Prevalent in San Javier Camp—San Jose de Gracia Mines Being Reconditioned

NUMEROUS improvements are being made at many of the mining properties located in the famous old silver camp of San Javier, which is situated in the foothills of the Sierra Madre Mountains, 16 miles from the terminus of the Yaqui River railroad at Tonichi, the nearest freight shipping point, and 126 miles from Hermosillo, the capital of the State of Sonora, Mexico.

The Las Animas mine, developed to its tenth level, is running steadily on 35 to 40 oz. silver ore carrying considerable lead and some gold. A new flotation machine has recently been added to the mill which will increase its capacity materially. At the Ubalama mill, which has been working on oxide ores from the mine of the same name, a change from cyanide treatment to flotation is being considered so that ores encountered in the sulphide zone may be handled profitably. A long drainage tunnel is being completed at Los Bronces, the oldest mine in the district.

Numerous important improvements are being made at the El Tajo Mining Co.'s property near Poza station. A 50-hp. engine has been installed. Placeritas mine, 35 miles northwest of Hermosillo, is shipping steadily silver-lead carbonate ore to El Paso smelter. The Cueva Santa mine, 3½ miles from Vega station, held and worked under lease and bond by J. Campbell Besley, is working in good shipping silver-lead carbonate ore. This mine is an antigua, last worked in the days of the Spaniards. A tunnel 250 ft. long has recently been driven into excellent lead-silver orebodies. The same management is also shipping antimony ore. A. T. Cooper, of South Dakota, has purchased the A. L. Lewis interests in the lease held by Lewis and Taylor on the old Butters mines and cyanide tailing dumps at La Colorada, 35 miles from Hermosillo. A pilot mill is in operation testing these immense dumps. W. Taylor is in charge of this experimental work. The graphite mine, owned by the United States Graphite Co., and situated near Moreno station 40 miles north of Guaymas, is shipping ore steadily to the company's manufacturing plant at Saginaw, Mich. There are several other graphite properties in the vicinity, the most developed being the Santa Rita, which is 3½ miles from Escalante station on the Southern Pacific de Mexico railroad.

The San Javier Milling Co., which recently completed the construction of a tailing plant, has made a short test run, and will soon be operating steadily. Steam power for the mines and mills of this camp is generated from natural coke, beds of which are found three miles from town. This fuel is very efficient and is mined and transported at low cost.

Below the Sonora boundary line, in northern Sinaloa, at Fuerte, is the Calabacillas mine. In the main shaft of this

property, on the 700 level, a working connection has been made which drains the mine down to this level and greatly facilitates unwatering the workings. It is said that when the lower levels are unwatered, sufficient ore will be available to begin production. The mill has been thoroughly overhauled and is now in good running order.

The San Jose de Gracia property was taken over on Feb. 1 last by the Chandis Securities Co., of Los Angeles, which is pursuing an energetic campaign of development. These mines are among the most famous on the west coast of Mexico, having had a total production of $20,000,000, beginning under the Spanish occupation. During the presidency of Victoriano Carranza, 1915-17, the Mexican government worked these mines for three years, confining operations to the then already developed ore, and ceasing only when it became necessary to spend money in development. The San Francisco mine, included in this group, has already been cleaned out and a development drift advanced 150 meters on low-grade but good commercial milling ore. The Carpenteria mine has also been cleaned out, and development is now going forward. A crosscut 145 ft. in length has been driven to the Jesus Maria vein and a drift is now under way on the southern extension. A winze is being sunk on the Todos Santos vein, and the La Cruz is being cleaned out with the object of developing the northern extension of the Todos Santos vein. Several cross-veins are also being developed. Gold accounts for 90 per cent of the value of the ore in this vein system. The mineralized area is about four kilometers long by two kilometers wide. Labor conditions are favorable and the operators are meeting with good support from the Mexican officials. This property is equipped with a mill, flotation cells, and electric power plant; a force of 175 men is employed on the property.

The new mining laws, which are being prepared by the national authorities are expected daily. It is generally supposed that many of the annoying details attendant to legalizing old titles and taking up new properties will be eliminated.

Pickands, Mather & Co. Curtail Operations

Sinking Resumed at Blueberry Mine—Cliffs Shaft Property Has Best Month in Forty Years

PICKANDS, MATHER & CO. has curtailed operations at some of the company's mines on the Gogebic and Menominee ranges. The Penn group of mines, at Vulcan, have been placed on a working schedule of five days per week, and the Newport mine, at Ironwood, is now on the same basis. Palms-Anvil, at Bessemer, has been placed on four days per week, and some men have been discharged at the Sunday Lake mine, at Wakefield. It is said that the reason for the reduction at this time is that furnaces are not going to take all of the ore for which they arranged earlier in the season.

The same company has decided to sink a new shaft at Vulcan to replace the East and Central Vulcan shafts. This shaft will have five compartments and will be put down to a depth of 1,100 ft. It will be concreted down into the ledge, and steel sets will be used for the entire distance. A new engine house and a new change house will be constructed and some new electrical equipment added.

THE Ford Motor Co. has resumed sinking operations at its Blueberry mine, on the Marquette range. This shaft was put down into the ledge a distance of about 100 ft. and concreted, early in the year, and then all work was suspended until the permanent equipment on the surface had been installed. The total depth of the shaft will be 1,000 ft. The old North Range shaft, close by, is being sunk deeper and will serve as a second outlet for the Blueberry. This week the Ford company placed three diamond drills in operation on the Richards lands, near Crystal Falls, on the Menominee range. This property was under lease to another operator and recently reverted to the Ford company.

The C. K. Quinn Ore Co. is now operating the Gwinn mine, on the Marquette range. This property was developed by the Cleveland-Cliffs Iron Co., who surrendered the lease last March.

The Cliffs Shaft mine of the Cleveland-Cliffs Iron Co., on the Marquette range, had the best month in its history of over 40 years, in June. A total of 37,742 tons of hard hematite was taken to the surface, with only one shift employed. This is equivalent to over five tons per man per day, which is considered a very good record for a hard-ore mine. The increased output is to be credited largely to the 36 heavy scrapers and hoists which are now in use underground. The mine is one of the few hard-ore properties on the Lake Superior ranges. Two-thirds of the product is shipped crushed and one-third as lump.

A bronze tablet was recently unveiled in the Greenway school at Coleraine, Minn., on the Mesabi iron range, to the memory of the late General John C. Greenway, who built the town of Coleraine for the Oliver Iron Mining Co.

Shaft head on the Alderson-Mackay property in Boischatel Township, northwestern Quebec, Canada

Alderson-Mackay Property Attracting Attention

DEVELOPMENTS at the Alderson-Mackay property, in Boischatel Township, northwestern Quebec, are attracting considerable attention. About the end of August aggressive underground work will be started on four levels. The shaft which is being sunk to a depth of 500 ft. is now down 465 ft., and three levels are ready to be opened up. The shaft, which is a vertical one, is now in ore, having entered the sulphides at a depth of 412 ft. This is said to be the western extension of the large new orebody cut during the last diamond drilling on the tract.

Recent developments at this property have been highly important, and at the present time a deep diamond-drill hole is being put down to intersect the ore zone at depth. This hole is now down 1,050 ft. It has already cut sulphides at a depth of 860 ft., but is not yet in the ore zone. The dip of the ore zone is not exactly known, but it is expected the orebody will be struck soon. Where the sulphides were encountered at a depth of 860 ft. the orebody showed a thickness of six ft. A repetition of the results at the 550 level at depth would mean much for the Alderson-Mackay interests at this time.

The Nipissing Central Railway is now surveying a spur into the property. Details in connection with the formation of the new company—Aldermac Mines, Ltd.—are understood to have been completed.

Mammoth Mines Reopening

THE Mammoth Consolidated Mines Co. is erecting new surface buildings and equipment at the Mammoth group of claims, in the southwestern corner of Mono County, Calif., 45 miles northwest from Bishop. This construction is in preparation for reopening the mine, which was an important gold producer forty years ago.

Alameda Develops Orebody on Abandoned Property

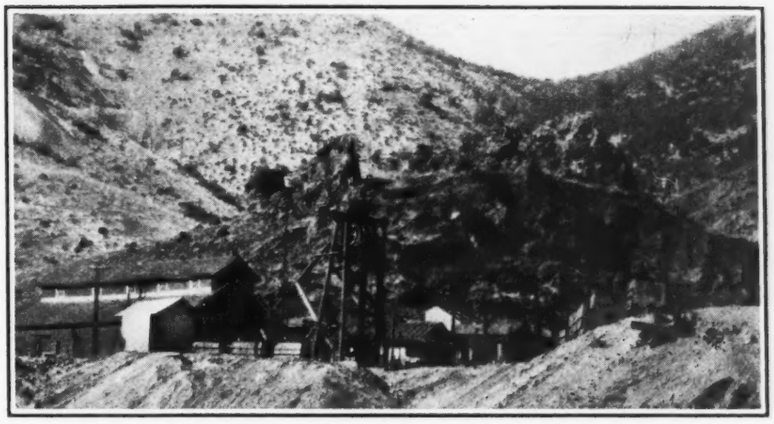
Evolution Mining Co. Formed to Work Claims Near Osborn—Senator Borah to Speak at Miners' Picnic

ABOUT ten years ago the Alameda Mining Co., of Wallace, Idaho, brought suit against the Success Mining Co., enjoining the latter from further extraction of ore from Alameda ground and demanding recovery for ore already extracted. The suit involved the question of apex of the vein and resulted in a victory for Alameda in the trial court. Appeal was taken to the Supreme Court of Idaho, which reversed the lower court, and the decision ended the litigation. Efforts to locate ore outside the area in dispute having failed, Alameda discontinued development and remained practically inactive up to a few weeks ago.

Present development of the Alameda consists of a crosscut about 2,000 ft. in length, and a drift on what was presumed to be an extension of the Success vein for a distance of about 200 ft. The only evidence of a vein in this drift was a thin mineralized stringer which persisted without material change, and the drift was finally abandoned. Work was recently resumed at the Alameda in this drift. After the first two rounds the stringer began to widen and when progress of ten feet had been made the face of the drift showed 18 in. of ore, much of it zinc of good shipping grade. The ore and the conditions of the occurrence are identical with those at the Success mine. All indications point to the development of an extensive body of ore.

About a year ago O. L. Smith secured a bond and lease on the Evolution group of claims near Osborn, in the Coeur d'Alene district, Idaho, running for five years. Later he assigned the bond to Conrad Wolfle, who has succeeded in getting the support of New York capital for the development of the property. The Evolution Mining Co., has been incorporated under the laws of Idaho, and preparation is now being made for installation of machinery and equipment for carrying out an extensive development program. Special interest attaches to this enterprise, on account of the fact that the claims were located by Andrew J. Pritchard, the intrepid prospector who in 1883 discovered gold in the creek that bears his name, an event that led to the discovery of the great lead-silver deposits which have made the Coeur d'Alene district famous. Mr. Pritchard located the Evolution in 1884, this being among the first quartz locations made in the district.

The Cedar Creek Mining & Development Co. of Wallace, Idaho, has entered into a contract with Charles Hyle, of Portland, Ore., for the construction of a flotation mill of 100 tons' capacity. Plans for the mill, which is to be completed in the fall, have been prepared by W. L. Zeigler, superintendent of the Hecla mill. The Cedar Creek mine is a lead-silver and zinc property situated in the north section of the district.



Greene Cananea Copper Co.'s Veta Grande shaft at Cananea

The annual miners' picnic will be held at Kellogg, Idaho, on Aug. 20-21. This is always a big event in the Coeur d'Alene district, and will be especially notable this year in the fact that Senator William E. Borah, of Idaho, will be the speaker for the occasion. The presence of Senator Borah makes the event more than a Coeur d'Alene district affair, and visitors are expected from all parts of northern Idaho and from Spokane, Wash.

Memphis Mine, Near Organ, New Mexico, Is Sold

SALE of the Memphis mine, situated near Organ, N. M., by the Memphis Mining Co. to George E. Woodin, of Boston, Mass., is announced. At present operation of the property is in charge of Dr. T. M. Baines, of the faculty of the Colorado School of Mines, at Golden, Colo., who is also making a geological survey of the property and installing equipment sufficient to do extensive development work.

The Memphis mine is just north of the main road to the San Augustin pass, 14 miles from Las Crucas. It is one of the old properties in the Organ district and has produced $250,000 worth of copper, lead, zinc, and silver. The property consists of four claims. Three shafts have been sunk on the property and extensive drifting has been done. One shaft is 165 ft. deep and another 400 ft. Considerable copper has been taken out of the open cuts and surface workings.

La Porte Gravels Being Worked

RENEWED activity is reported at a number of gold-gravel properties in the La Porte district, Plumas County, Calif. The La Porte Mines, Inc., have taken over the Feather Fork group from McFarland Brothers, and are preparing to sink an incline shaft. The same company also controls the Buel mine in Little Grass Valley. Gold-bearing gravel is stated to have been struck in the Bunker Hill mine, near Gibsonville.

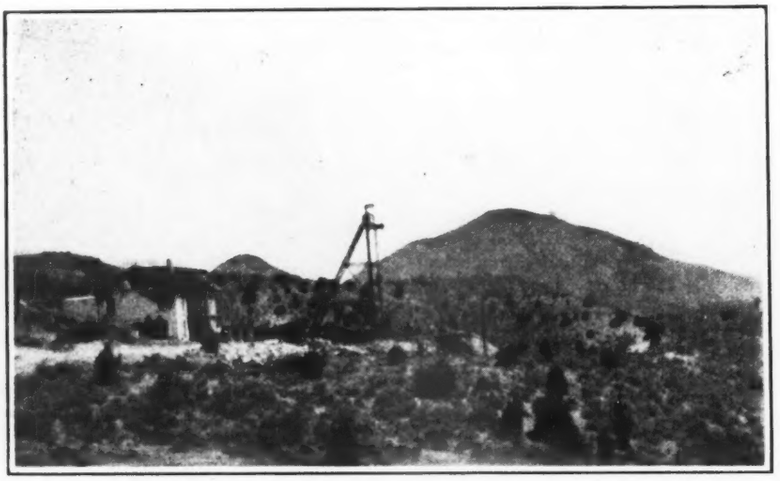
Greene Cananea Obtains Good Development Results

FAVORABLE reports continue to emanate from the Greene Cananea Copper Co., operating at Cananea, Sonora, Mexico. In the past, Cananea has been looked upon as a "shallow" camp. With the exception of the Capote mine, which is 1,500 ft. deep, practically all mining in the other divisions has been carried on between the surface and the 800 level. In general, there has been a zone of impoverishment from about 400 ft. to the 800 level, and it was believed that in many parts of the camp no high-grade ore existed at depth.

Diamond-drill work at the Colorado property was done primarily to develop a low-grade tonnage, which was believed to exist between the 1,000 and 1,200 levels. However, in carrying out this work, a large body of high-grade ore was encountered. According to Mr. Wraith, the vice-president of the company, the orebody on the 6 level of the Colorado is 500 ft. long, with an average width of 40 ft. The 40 ft. in width is the average of six crosscuts. On the 7 level, where work has not gone so far, the orebody has been opened up for a length of 220 ft. with a width of 60 ft. It is expected on the basis of the results of the drilling that high-grade ore will be found in some sections on this level.

Some of the drill cores show exceptional values, and though the management thoroughly appreciates the fact that the average for the orebody will not be of such high grade, there is confidence that even the average for the orebody will be favorable and permit of excellent profits on a normal market. Development work in the upper levels of the new find is said to be responsible for about 25 per cent of Greene Cananea's present output, which ranges between 2,500,000 and 3,000,000 lb. of copper monthly.

When the new high grade is added to the present reserves it should be possible for Greene Cananea not only greatly to increase its present monthly output if conditions warrant, but also to produce copper at a low cost.



One of the East Tintic district's heaviest shippers. The North Lily mine, near Eureka, Utah

Survey of Utah Mining for the First Six Months of 1927

Ore Production Shows an Appreciable Decrease—Two New Shippers in Tintic District—Total Dividends Establish Post-War Record

By Gail Martin
Special Correspondent

UTAH'S ore production for the first six months of the year ending June 30 shows an appreciable decrease because of lower metal prices. Bingham mines, particularly the Utah Copper and the Utah Delaware of the International Smelting Co., have curtailed shipments.

Decreases in production have resulted almost altogether from the drop in the price of lead and zinc. Were lead and zinc in demand at the prices ruling last year, 1926 production records would no doubt have been excelled, as the physical condition of the mines and the number of new flotation mills erected in the state would permit operations of a size never before approached in Utah's sixty-five years of continuous mining.

Tintic mines produced during the first six months of 1927, 3,711 carloads of ore and concentrate, compared with 4,833 carloads for the same period last year. Tintic Standard, with a total of 1,089 carloads of 80 tons each, was the leading shipper. Chief Consolidated shipped 470 carloads of 50 tons each, and its Plutus mine 406 carloads. Bingham Mines was the third largest producer, with a shipment of 414 cars.

If the total ore production of the Tintic district has not been as good as it was during 1926, underground developments have been much better. Two new producers—the North Lily of the International Smelting Co. and the Eureka Lily of the Chief Consolidated Mining Co.—have been added to the list of shippers. Conditions uncovered in the east side of the district, north of Tintic Standard, presage a remarkable expansion of production and activity in the near future.

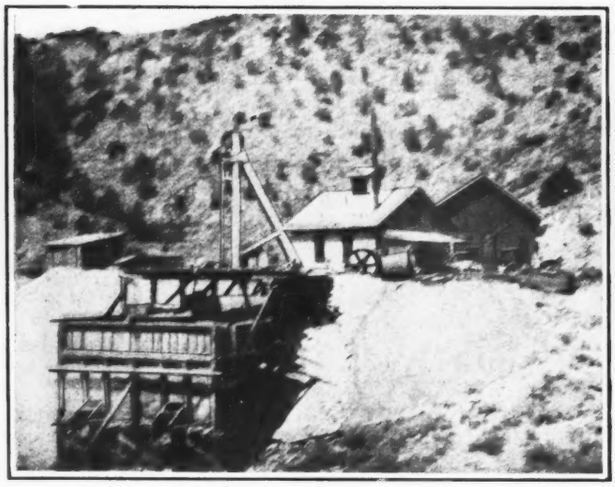
The record of the North Lily is one that few underground mines anywhere have duplicated during recent years. Within less than six months after underground work was started, 116 carloads of ore, averaging 80 tons to the car, have been shipped. Earnings of the mine have been fully as remarkable. A good profit was made above the initial heavy cost of development, which included the sinking and equipping of a four-compartment shaft and the driving of a half-mile drift from the 900 level of the Tintic Standard No. 2 shaft to cut the downward extension of the orebody exposed on the North Lily 700 level.

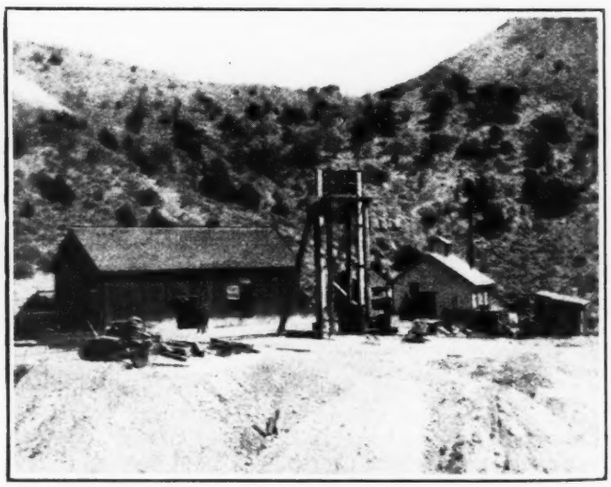
Production of Park City district mines for the first six months of 1927 totaled 208,817 tons of ore and concentrates as compared with 188,364 tons for the same period of 1926. The increase in output was caused solely by the large shipments of the Park-Utah Consolidated Mines Company, which shipped 157,832 tons, or thirty per cent more ore than for the same period of 1926. This total makes the Park Utah enterprise the largest underground mine in Utah and second only to the Utah Copper.

The Silver King Coalition Mines shipped a total of 36,643 tons of ore for the first six months of 1927, compared with 49,230 tons. As a result of the high grade of this mine's product the gross receipts of the property are close to these of the Park Utah. The Silver King output has been curtailed because of low metal prices.

Utah metal mines disbursed during the first six months of 1927 a total of $7,830,334, compared with $7,369,064 for the same period of 1926, setting a new dividend record for post-war years. Utah copper, with a total of $4,873,470, ranked first in dividends; Tintic Standard, with $1,268,206.50, second; Park Utah, $730,700, third; and Silver King Coalition, $608,050, fourth.

Surface plant at the Iron King mine in the East Tintic district, control of which is held by Tintic Standard Mining Co.





No. 2 Shaft of Quincy Mine Reopened After Fire

Calumet & Hecla Consolidated to Add Another Large Furnace to Hubbell Smelting Plant

PUMPING has been resumed in No. 6 shaft of the Quincy mine in the Michigan copper district, and No. 2 shaft, in which fire broke out July 13, also has been reopened to allow the gases to clear. The fire was permitted to burn itself out before the battening was removed from the shafts. Engineers of the U. S. Bureau of Mines, who were in charge of the fire situation, are of the opinion that No. 2 will clear itself of gas. If any gas lingers in the lower levels it can be eliminated by use of compressed air. The amount of timber just above the fire area, which centered at the 53 level, was comparatively small, according to the management, and the damage may not be great. The timber will be replaced and the shaft again put in commission. Pending a resumption of operations, the stamp mill and smelter are shut down. Approximately 900 men were thrown out of work by the fire.

Calumet & Hecla Consolidated has plans for the construction of another large furnace at its smelting plant at Hubbell, in the Michigan copper district. This will give the company four large units, three for smelting and one for refining. The smelter also is equipped with a modern casting machine. The proposed new furnace will have a capacity of 600,000 lb. at one charge, and it is understood its construction will increase the smelter's capacity to 20,000,000 lb. of copper per month. Labor costs have been largely cut through the installation of modern furnaces and equipment at Hubbell. The casting machine is capable of handling 100,000 lb. of copper in one operation, requiring the services of only a few men.

AT Calumet & Hecla Consolidated's Cliff property in Keweenaw County, which will be used as a base for extensive exploratory and development operations in a promising zone, dewatering is still in progress. Several levels remain to be drained before the 20 level is reached, where exploration will begin. At the old Crocker shaft of the Phoenix property, which will be used in conjunction with Cliff, buildings are being erected to house the surface plant.

Calumet & Hecla Consolidated's No. 16 shaft on the Osceola amygdaloid lode is in commission. This is the fourth shaft to resume on this formation, leaving only two, Nos. 17 and 18, in idleness. No. 16 has been undergoing repairs for several months. Men thrown out of work when the Seneca mine shut down were given employment in No. 16, as well as a number from Quincy, which is closed on account of conditions arising from the fire in No. 2 shaft.

Mayflower-Old Colony now is drifting south in the vein encountered by the crosscut west from the 1,700 level of the shaft. The opening has proceeded only a short distance, and the lode continues narrow, which was the discouraging feature to the north. It contains some copper values. The drift will be continued in the hope the vein will widen.

Boulder, Half Silver, Found on Farm in Ontario

CONSIDERABLE excitement has been aroused in the North Bay district of Ontario, by the discovery, on a farm at Verner, of a boulder weighing over 300 lb. which is half native silver. The find has been corroborated by John A. Dresser, development geologist of the Canadian Pacific Railway, who has examined the boulder. He places its value at about $1,200. The farm on which it was found is about 100 miles south of Cobalt. Offers have been made to purchase the boulder for its value in silver. It is altogether likely that the find will be made a feature of the mineral exhibit of the British Empire Mining Congress in Canada this fall.

Combined Metals Company Curtails Operations

Pan-American Company Takes Over Claims—Tungsten Comet Mine May Resume Operations

THE Combined Metals Reduction Co., of Pioche, Nev., has materially reduced the scope of its operations owing to the present price of lead, a 50 per cent reduction in the working force taking place in July. Operations will be confined to development work.

The Pan-American Mining Co., of Los Angeles, Calif., which recently took over the Mount Comet, Stella, and Central groups of claims in the Comet district of Nevada, plans to install machinery this fall. The property is being financed by the Charles Wesley Co. of Los Angeles.

The Tungsten Comet mine, in the Comet district, may also soon again be in the producing class. The bond holders in the West are taking legal action to protect their interests, which action may result in the resumption of operations at the mines.

Patrick Mine Washing Plant Destroyed by Fire

ON JULY 31 the washing plant of the Patrick mine at Nashwauk, Minn., operated by Butler Bros., was destroyed by fire, with a loss estimated between $80,000 and $100,000. The plant, a building of steel and wood construction, was hit by a bolt of lightning which ignited gasoline being used by the employees to clean machinery.

Washington Letter

By Paul Wooton
Special Correspondent

Six Electrical Prospecting Methods Tried Out by Bureau of Mines

Washington, Aug. 7, 1927.

SIX electrical methods of prospecting have been tried out by the U. S. Bureau of Mines at its proving ground in the Caribou hills, near Boulder, Colo. The ground has been gone over also with gravity methods. The location and extent of the mineral deposits in this area are known. Different methods tried show interesting variations, but in general are in concordance.

It had been known for some time that considerable work of this character had been done by private interests in the development of their devices, but few of the results from this work have been given to the public. From these sources, however, the Bureau is now receiving offers of co-operation and exchange of data.

It is the intention of the Bureau to publish promptly the results of the work it is doing in co-operation with the Colorado School of Mines. It now seems likely that this material will be augmented by that developed in some of the private research which has been done on geophysical methods of prospecting.

An examination is to be held by the Civil Service Commission for senior and junior geophysicists, so that personnel will be available to carry on this work, for which more money likely will be available next year.

FREIGHT rates on silica and ferromanganese from Niagara Falls to Laredo, Tex., for export should be found unreasonable, Interstate Commerce Commission Examiner Colvin states in a report to the commission.

Examiner Weems in another report recommends the dismissal of the complaint of the Athletic Mining & Smelting Co., which contends that rates on spelter from Arkansas and Oklahoma points to numerous interstate points are unreasonable. The examiner finds that the rates are reasonable and otherwise lawful.

Complaint has been filed with the Interstate Commerce Commission contending that freight rates on lead dross and scrap pig lead from Richmond, Va., to Baltimore, Philadelphia, Newark, and New York are unreasonable.

Four Aces to Enlarge Mill

THE pilot mill of the Four Aces Mining Co. on Volcano Creek, in Placer County, Calif., is treating 50 tons daily of free-milling gold ore. Plans are being drawn for a larger mill of 150 tons' daily capacity.

Toronto Letter

By Our Special Correspondent for Northern Ontario

New Gold Discoveries at Rainbow Lake Cause Much Excitement

TORONTO, AUG. 6, 1927.

A GREAT deal of excitement exists at present as a result of the new gold discoveries made at Rainbow Lake, in the Red Lake section. Companies operating airplanes into the district are booked up well in advance by prospectors and engineers anxious to get in and stake claims. Only a small amount of prospecting has been done to date, but seven veins, all carrying visible gold, have been found, the width varying from 1½ to 7 ft. Preliminary sampling indicates high values, and there is a considerable amount of free gold. A crew of men with supplies has been sent in to open up the original discovery, and a large number of other claims are being staked in the neighborhood. General results throughout the Red Lake section are promising, and at least a dozen substantial organizations are carrying on the work on the different properties.

At the Coniaurum property, at Porcupine, recent developments on the 1,500 level have substantially enhanced the value of the property. On the No. 7 vein three oreshoots have been developed, having a combined length of 700 ft. The most important development, however, is on No. 12 vein, which has been opened up for a length of 200 ft., carrying a grade of ore higher than the average heretofore obtained. It is understood that an official statement will be issued within a few days, and it is expected to forecast the continuation of the shaft to 2,000 ft., and possibly the building of a mill.

THE option held by Noah Timmins on the Jackson-Manion was allowed to lapse at the end of June through a failure to make a final payment of $140,000, but it is believed that negotiations are still under way between these two interests, and possibly a new deal may be arranged.

The tonnage at the Sylvanite mill, at Kirkland, has now been brought up to 200 tons a day. A satisfactory grade is being obtained and a reasonable profit made.

The new mill of Associated Goldfields, in Larder Lake, is now working much more satisfactorily, and arrangements are being made to bring the capacity up to 100 tons per day. Tube mills are being installed, and with these running it is expected the mill can handle 200 tons.

Diamond drilling on the Amulet property in Quebec continues to give favorable results, and the future of the property as a profitable producer, now seems assured. Indications also point to the possibility of opening up a mine of substantial proportions. The new ore is much higher in grade than that formerly found, and contains a much smaller quantity of zinc.

It is expected that further news regarding Noranda should be available soon, as the opening up of three new levels will soon be started. Diamond drilling recently proved an existence of new ore, carrying high values in gold.

The Wright-Hargreaves mill, of Kirkland Lake, is now treating 600 tons a day, with the possibility that there may be further increases in the near future. Development work on the 1,250, 1,375 and 1,500 levels on new ore found west of the fault continues favorable.

Disputes have been filed against some of the claims recently taken under option by the Coniagas, which will probably delay the exploration work. It is understood, however, that surface sampling has given satisfactory assays.

On the Pioneer group, a contract has been let for diamond drilling, and it is also expected that a mining plant will be installed. The company has opened up an area of good ore 300 ft. long by 37 ft. wide.

Interest in Divide District Revives—Prospectors Busy

All Open Ground in the Vicinity Is Re-located and the Surface Combed for Outcrops

RECENT DEVELOPMENTS in lease workings in the Divide district, five miles from Tonopah, Nev., have revived interest in that district. All open ground in the vicinity has been re-located and prospectors are busy combing the surface for good outcrops.

On the Brougher Divide company ground, on which important finds have recently been made, active development work is being done in five lease blocks. These blocks are 400 ft. square. Development so far is by shaft only, following the ore. The most important showing is in a joint shaft being sunk on the end line between the Thomas block and the Sanger-Maupin block. This shaft is down 70 ft., the first 12 ft. being in wash material and the last 58 ft. in ore. The bottom of the shaft shows 8 ft. of excellent ore, which is similar in character to that found in the Tonopah Divide mine, a soft oxidized volcanic breccia showing some silicification, carrying values in silver and gold, the silver predominating. The silver occurs as the chloride. In the center of the ore is a high-grade streak, about two inches wide, of porous white quartz, with the pores partly filled with horn silver. In the Anderson block two shafts are down 30 ft. in ore; and in the Bosanko block a shaft is down 25 ft. in ore. So far all work has been by hand, but adequate hoisting machinery and compressors have been ordered and should be installed within thirty days.

In the Tonopah Divide mine, Jamison and Pazson are opening a new orebody on and above the 300 level.

Mexico City Letter

BY W. L. VAIL
Special Correspondent

Opening of 800 Miles of Road in Lower California to Aid Mining Industry

MEXICO CITY, AUG. 1, 1927.

THE opening last month of 800 miles of automobile road down the length of the Peninsula of Lower California will most probably give an impetus to mining exploration and exploitation in that section of Mexico. The new road follows the Pacific Coast from Tia Juana, near San Diego, Calif., touching Ensenada, St. Elmo, San Quentin, Santa Tomas, and Rosario, to the Bay of San Sebastian, where it crosses the backbone of the mountains to Muleje, on the Gulf of California. After continuing to the big copper camp at Santa Rosalia, it turns inland, touching La Purissima, Commondu, and Soledad. It meets the Pacific Ocean again at Juncal, on the Bay of Magdalena, continues on to Cape San Lucas, the most southerly point of the Peninsula, and then circles back to La Paz and the Boleo Copper properties, at Santa Rosalia. This road will give transportation facilities to a large area of mineralized country and will probably lead to the reopening of a number of abandoned properties which have been good producers in the past.

Among the best-known properties to be benefited are the large onyx quarries near Rosario; the Chapala gold-silver mines, American owned and at present idle; the gold mines at Callami, belonging to an English syndicate, big producers at one time and abandoned at the 700 level because of water and lack of transportation for moving in necessary machinery; the El Arco gold mine; and the large Boleo properties on the Gulf of California now operating eight furnaces.

MINING chambers throughout the republic and individual groups continue to oppose the recent decree of the president, taking the management of labor troubles out of the hands of the state authorities and passing them over to the Department of Industry, Commerce, and Labor. The opposition insists that the decree, apart from being impracticable, is an infringement on specific articles of the Constitution of 1917.

Alaska Juneau in June

ALASKA JUNEAU in June, 1927, mined and trammed to mill 378,700 tons, from which $183,000 in gold, lead, and silver was obtained, or 48.32c. per ton. Costs were $177,100, or 46.76c. per ton, and operating surplus was $5,900, or 1.56c. per ton. Other expenditures and charges totaled $15,900, leaving a deficit of $10,000 for the month.

Johannesburg Letter

By John Watson
Special Correspondent

Recent Lisbon Decree Affects Recruiting of Natives for Rand Gold Mines

Johannesburg, July 5, 1927.

AT THE quarterly meeting of the Transvaal Chamber of Mines, held in Johannesburg on June 27, Douglas Christopherson, president, directed the attention of members to the increasing importance of the supply of East Coast natives for the Rand. Since the end of February, there has been a falling off in the supply of British South African natives, and the decree, recently published in Lisbon, insists that only natives who have resided in the Province of Mozambique during the whole year previous to engagement will be allowed to contract for service on the Rand, and then for a period of only twelve months. Consequently the gold mines must recruit about double the number they have been recruiting in the past. The decree will take effect at the end of this year, and, if terms are not arranged to safeguard the supply of East Coast natives, the mines and the Union will be faced with economic disaster.

Dr. H. Pirow, government mining engineer, in a recent report mentioned the fact that the community derives benefit from the distribution of the sums expended in working costs more than from that direct revenue accruing to the state. The expenditure last year on working costs on the Transvaal mines was £28,500,000.

Major A. J. Pelling, in his recent paper on "Fertilizer Deposits of South Africa," read before the Chemical and Metallurgical Society, said: "South Africa would be neglecting a duty to posterity if it omitted to make an economic survey of its natural fertilizers. As an instance of the apathy shown, the wonderful deposit at Mamre, along the coast north of Capetown—one of the world's largest low-grade phosphate deposits—was not yet exploited, for the purpose of direct application to the land, in a part of the Cape Province so notoriously short of lime."

AT THE recent general meeting of the Witwatersrand Co-operative Smelting Works, Ltd., D. Christopherson, president, said the total surplus earned by the byproducts branch was £7,424, compared with £32,346 surplus for the previous year, a decrease of £24,922. This is due chiefly to the dwindling yield of osmiridium from the company's dam of accumulated residues. Of the osmiridium obtained by the byproducts branch, 555 oz. was valued at £30 to £40 per ounce, 394 oz. at £25 to £30 per ounce, and the remainder of 376 oz. brought an average price of £12 6s. 3d. The price for osmiridium for the last year was about £10 per ounce.

Sir Robert N. Kotze, who was government mining engineer from 1908 to 1926, has an article in a recent issue of the *Mining and Industrial Magazine*, published in Johannesburg, in which he states: "While the cheery optimist talks glibly of undiscovered, or unworked, payable reefs and areas and trusts to luck, the industry has more solid grounds for hope in improved mining conditions such as narrower stoping by jackhammer drills, with the use of two, or even one, steel of best quality for the purpose." Further geological investigation of the far west Rand is also advocated.

A company named Synthetic Sandstones, Ltd., has recently been registered to make bricks, in the Germiston district, from one of the neighboring mine dumps.

Fire Destroys Empire Mill, in the Joplin-Miami District

New Crusher at Hartley Mill Attracts Attention—Domado Company Options Kitty Mine

FIRE of unknown origin destroyed the mill of the Empire Development Co., about 3 miles northeast of Picher, Okla., in the Joplin-Miami district, on the night of July 25. The mill, which was of 250 ton capacity, had been idle for some time, though its owner, F. W. Evans of Picher, had been carrying on development work in the ground recently and planned to operate the mill in the near future. The loss, estimated at between $50,000 and $75,000, was partly covered by insurance.

Improvements under construction for some time have been completed at the Hartley mill of the Interstate Zinc & Lead Co., and the property is about to begin regular production once more. Particular interest has been shown in the Symons cone crusher, which is among the installations. It is the first crusher of this type to be tried in this field, and has been installed on the theory that it will do away with four or five sets of 42-in. rolls at the head of the mill. Dirt from the mill hopper goes through a 24-in. crusher and then passes to a 1½ in. screen. Oversize from this screen goes direct to the cone crusher, where it is ground to ⅝ in. The undersize from the 1½ in. screen goes to the dirt elevator and then over a ⅝ in. screen, and the oversize from this screen is returned to the cone crusher. The mill will handle approximately 80 tons of rock an hour. A new power house has been completed, equipped with two compressors. Installations at the mill have been superintended by C. O. Anderson, a metallurgist formerly with the U. S. Bureau of Mines in this field.

The Domado Lead & Zinc Co. has taken a drilling option on the Kitty Mining & Milling Co.'s mine west of Cardin, Okla., and has placed several drill rigs on the lease. If the option is exercised, the Domado company plans to handle the dirt from the Kitty mine over the Jack and Jill mill, which it operates on the adjoining land.

London Letter

By W. A. Doman
Special Correspondent

Annual Profit of Tanganyika Concessions Shows Large Decrease for 1926

London, July 26, 1927.

THE annual report and accounts of the Tanganyika Concessions, Ltd., met with a rather mixed reception, for although the balance of profit for 1926 was £462,463, this sum was smaller by £265,414 than in 1925. The company is perhaps in a measure unfortunate in that the accounts of the Union Minière, in which it is so largely interested, are also made up to the end of the calendar year, so that the Tanganyika does not show any benefit from the larger dividend paid by the mining company. Being a holding company, Tanganyika naturally relies to a great extent upon dividends from investments. Receipts on this account, together with interest, aggregated £233,347; sales of shares and rights brought in £364,870. A certain number of Union Minière shares have been sold, but the balance held at Dec. 31 last had a market value largely in excess of the amount at which the whole of the shares and debentures of other companies are entered in the accounts—that is, £5,032,195.

AT THE meeting of the Rhodesia Copper Co., Sir Edmund Davis said that the initial difficulties at Bwana M'Kubwa are being gradually overcome. Output of refined copper, which assays 99.98 per cent, is being gradually increased and sold principally to British consumers, the company having declined to join Copper Exporters Incorporated. It is clear from the above that there are divergencies of opinion as to the wisdom of selling through an agency which a company does not itself control.

The report and accounts of the Rhodesia Broken Hill Company were regarded as rather disappointing, for there was a loss for the year, after allowing £56,442 for depreciation, of £75,086, raising the debit balance to profit and loss to £130,833. Active development has been carried out and substantial additions have been made to zinc ore reserves, and promising lead ore occurrences have been opened up.

Ruby Group in Pay Gravel

THE Mineral Mountain Mines Co., operating the Ruby group near Downieville, Sierra County, Calif., reports the east drift from its bedrock tunnel to be in pay gravel and nearing the main channel. The operators of the property also plan to sink a 300-ft. shaft to develop the quartz ledge uncovered in the placer operations conducted on the tract some years ago.

Societies, Addresses, Reports

Chief Consolidated Operates Successful Selective Flotation Plant*

Changing Character of Ore Makes Treatment Difficult—Satisfactory Reagent Scheme Devised

By Homar L. Johnson
Testing Engineer, Chief Consolidated Mining Co.

ORES of the Tintic, Utah, mining district have stubbornly resisted most efforts to treat them by the better-known concentration and metallurgical processes, other than smelting. However, these refractory characteristics have not discouraged the erection of numerous milling plants throughout the district. One of the most successful of these plants has been the flotation mill of the Chief Consolidated Mining Co. at Eureka.

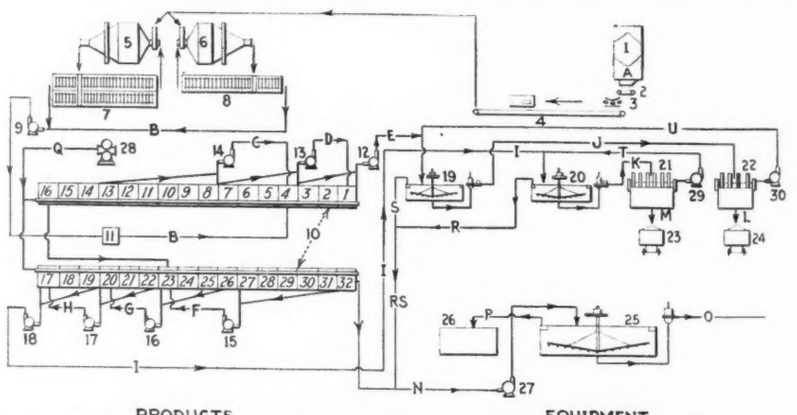
Extreme Variation of Ore

Although all of the ores treated come from the Chief No. 1 mine, the variations in grade and character are extreme. A few of the more pronounced types, on the basis of grade, are indicated in the accompanying tabulation:

Type	Ounces Silver per Ton	Per Cent Lead	Per Cent Zinc
1	20.0	20.0	8.0
2	25.0	8.0	4.0
3	9.0	10.0	18.0
4	6.0	5.0	25.0
5	15.0	15.0	7.0
6	5.0	8.0	20.0
7	7.0	4.0	12.0
8	11.0	10.0	11.0

IN WORKING out the metallurgical flow sheet, no means was available for determining the ore type that would predominate in the mill feed for any period of time. This condition exists because of the manner of the ore occurrence in the mine. As in most limestone replacement deposits, the orebodies are extremely irregular. It is impracticable to keep an appreciable tonnage of ore in sight or blocked out. This difficulty was overcome by adopting a reagent scheme most likely to give uniformly good results on all combinations of the different ore types. Many reagent combinations were encountered which would yield extremely good results on ores of one or two particular types, but when applied to the composite grouping, their failure would be complete. The combination finally adopted and which is now in use is as follows: Sodium cyanide, zinc sulphate, and thiocarbanilid to the ball mill. Thiocarbanilid serves as the collecting agent and is generally added dry at about 0.5 lb. per ton of ore; the sodium cyanide-zinc sulphate couple is used to inhibit the flotation of zinc and iron minerals, and the proportion is about one part of cyanide to two parts of zinc sulphate. Addition of sodium cyanide is generally at the rate of 0.5 lb. per ton also. At the surge box just ahead of the lead cells, potassium xanthate and T - T mixture are added: the amount of xanthate varies between 0.1 and 0.4 lb., per ton of ore. The T - T mixture is made up of 70 per cent orthotuluidine, 23 per cent thiocarbanilid, and 7 per cent cresylic acid; it is added to the lead cells in amounts ranging from 0.1 to 0.5 lb., per ton of ore. Experience has shown that the use of amounts in excess of 0.5 lb. per ton is wasteful, and because of the high cost of this reagent every precaution is taken to keep the consumption as low as operating conditions will permit. At the head of the zinc conditioning cells, 2.0 lb. per ton, of copper sulphate, and 1.0 to 3.5 lb. per ton, of hydrated lime, are added. As lime is a very active reagent in promoting the flotation of sphalerite and in inhibiting the flotation of pyrite in Chief ores, it is rarely practicable to approach the minimum figure given above. The maximum amount is used only on extremely pyritic ores and in some instances a high insoluble assay in the zinc concentrate results from its use. Near the end of the zinc conditioning unit, additional xanthate and T - T mixture is added. The amount of xanthate added here is generally less than 0.15 lb. per ton of ore; if added in excess of this amount a marked tendency for the pyrite to float is noted. The amount of T - T mixture is between 0.1 and 0.2 lb. per ton of ore. This is the basic reagent combination, though infrequent alterations of minor significance may be made. All reagents are added in solution, with the exception of the thiocarbanilid, which is added dry ahead of the ball mills. Other reagents are added from disk and cup feeders.

FLOTATION equipment proper consists of thirty-two Minerals Separation sub-aeration cells—two rows, of sixteen cells each, placed back to back. The first row includes cells for lead flotation and zinc conditioning; these cells are not equipped with spitzkastens. The second row comprises the zinc flotation unit, and is provided with spitzkastens. On the lead side four products are made: finished concentrate, primary concentrate, which is the feed to the cleaner-cells; scavenger concentrate, which is returned to the primary cells, and lead tailing, which makes up the feed to the zinc conditioning cells. On the zinc flotation side a finished or re-cleaner concentrate is produced, a cleaner concentrate which goes to the re-cleaner cells, a primary concentrate, and a scavenger concentrate as on the lead side. The zinc, or final tailing, is elevated to a 10x50 ft. thickener. The thickened tailing goes to the ...iing pond and the clear water over-



PRODUCTS				EQUIPMENT			
A	Crushed Ore 1"	L	Filtered Lead Conc.	1	Ore Bins 1200 ton capacity	16	2" Wilfley Pump
B	Flotation Feed 80 Mesh	M	Filtered Zinc Conc.	2	5-18" Apron Feeders	17	2" Wilfley Pump
C	Lead Scavenger Conc.	N	Final Tails	3	16" Collecting Belt	18	3" Wilfley Pump
D	Lead Primary Conc.	O	Thickened Tails to Pond	4	16" Weightometer Belt	19	25' Dorr Thickener
E	Final Lead Conc.	P	Tailings Thickener Overflow	5	8' x 48" Hardinge Ball Mill	20	25' Dorr Thickener
F	Zinc Scavenger Conc.	Q	Air 1-Lb. Pressure	6	8' x 36" Hardinge Ball Mill	21	6'-6 Leaf American Filter
G	Zinc Primary Conc.	R	Zinc Thickener Overflow	7	Dorr Duplex Classifier	22	6'-4 Leaf American Filter
H	Zinc Cleaner Conc.	S	Lead Thickener Overflow	8	Dorr Simplex Classifier	23	R. R. Car
I	Final Zinc Conc.	T	Zinc Filtrate	9	4" Wilfley Pump	24	R. R. Car
J	Lead Thickener Spigot	U	Lead Filtrate	10	Min. Sep. Flotation Cells No 1 to 32	25	50' Dorr Thickener
K	Zinc Thickener Spigot			11	Flotation Feed Surge Box	26	25' Mill Water Tank
				12	3" Wilfley Pump	27	4" Wilfley Pump
				13	2" Wilfley Pump	28	No. 7 Possitive Pressure Blower
				14	2" Wilfley Pump	29	2" Wilfley Pump
				15	4" Wilfley Pump	30	2" Wilfley Pump

Flow sheet of the Chief Consolidated Mining Co.'s flotation plant

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Parsons, A. B.: "Chief Consolidated Starts Novel Reduction Plant." *E.&M.J.*, Vol. 118, p. 582.

*Extracted from original article in June issue of *Colorado School of Mines Magazine*.

flow goes to the mill storage tank for re-use. A constant-density valve is used on the thickener spigot to provide accurate density control of the discarded tailing. Pulp density of the classifier overflow will average about 40 per cent solids, lead tailing about 30 per cent, and final tailing about 25 per cent. Feed to the concentrate thickeners averages 30 per cent solids; thickener spigot or filter feed will range between 55 and 70 per cent solids. The filter cake carries about 7 per cent moisture in the lead product and from 10 per cent to 12 per cent in the zinc concentrate.

COMPOSITION of the lead concentrates will vary somewhat with the headings. Average assay range is: 0.025 - 0.05 oz. gold, 30.0 - 50.0 oz. silver, 58.0 - 65.0 per cent lead, 5.0 - 10.0 per cent zinc, 3.0 - 10.0 per cent iron, 2.0 - 8.0 per cent insoluble, and 13.0 - 20.0 per cent sulphur. Fluctuations in zinc concentrate grade are also found to occur with headings variations. Average zinc concentrate assay range is: 0.02 - 0.03 oz. gold, 8.0 - 15.0 oz. silver, 1.0 - 5.0 per cent lead, 42.0 - 55.0 per cent zinc, 4.0 - 8.0 per cent iron, 5.0 - 12.0 per cent insoluble, and 28.0 - 35.0 per cent sulphur. Both lead and zinc concentrates contain small percentages of lime and magnesia, as well as some copper, usually less than 0.5 per cent.

The grade of tailings is largely dependent upon the character of the ore. Experience has indicated that the best results to be expected from good clean sulphide ores are about: 1.0 oz. silver, 0.8 per cent lead, and 2.0 per cent zinc. Under less desirable conditions these assays may be as high as 2.0 oz. silver, 1.5 per cent lead, and 4.0 per cent zinc.

University of Alabama Offers Research Fellowships

THE School of Mines of the University of Alabama offers five fellowships in mining and metallurgical research in co-operation with the U. S. Bureau of Mines. These fellowships are open to graduates of universities and engineering schools who have proper qualifications to undertake research investigation. The value of each fellowship is $540 per year of nine months beginning Sept. 1. Research will consist primarily of laboratory work directed by the Bureau of Mines technologists and the School of Mines staff. The following problems have been tentatively selected for investigation for the year 1927-1928: Beneficiation of low-grade bauxite ores; beneficiation of phosphate rock. Applicants should send a copy of their collegiate records from the registrar's office of the institution where they have graduated. They should also state their professional experiences and give the names and addresses of at least three persons who are familiar with the training and ability of the applicant.

Applications should be addressed to Director, School of Mines, University of Alabama, University, Ala.

Michigan Section of A.I.M.E. Meets at Houghton

A MEETING of the Upper Peninsula of Michigan section of the American Institute of Mining and Metallurgical Engineers was held at Houghton on Aug. 3. It was attended by E. L. DeGolyer, president of the Institute; H. Foster Bain, secretary, and 125 members from the iron and copper districts of Michigan.

President DeGolyer spoke of the great advance that has been made in the oil industry, particularly in the methods of locating new oil deposits. He stated that owing to a more thorough knowledge of formations and the geology of oil structures, drilling for oil is now attended with a considerable degree of certainty, and that in spite of the present overproduction of oil, the search for new oil deposits must continue in order to meet the future demand.

Secretary Bain stressed particularly the cohesion of all members of the Institute that it might play an even bigger part in the national life. Referring to government aid in the matter of research and the solving of various problems met with in the mining industry, he said that although agriculture contributed approximately twelve billion dollars annually to the national wealth, and the mining industry contributed over six billions, yet agriculture received fully thirty times as much money from the government as the mining industry.

Circulars Available on Regional Economic Matters

THE Division of Regional Information, Bureau of Foreign and Domestic Commerce, follows economic conditions and tendencies that may affect American business in foreign countries, and furnishes a background for the work of the commodity and technical divisions of the bureau. Manufacturers, exporters, bankers, and others in this country are, as a rule, familiar with the publications originating in the division and issued by the bureau in the form of trade information bulletins and articles in the weekly *Commerce Reports*. It is not so generally known, however, that in view of limited space available in the printed publications, considerable additional data are issued in the form of mimeographed circulars covering a wide variety of subjects pertaining to foreign trade and economics.

The mimeographed circulars of the Division of Regional Information are distributed free of charge to firms applying for this service. Five mailing lists are maintained, namely: Canada, Europe (including the Near East), Latin America, Far East, and Africa. In addition, confidential circulars on these territories are issued to American firms whose names appear on the exporters' index of the bureau.

The circulars include: "Commercial Notes on Canada," issued weekly and outlining the most recent commercial and economic trends in that country; a series of statements on office operating expenses and living costs for Americans in foreign countries; a set of bibliographies on Far Eastern areas; miscellaneous titles such as "Selling in China." "Trade of United States with Far East," "Foreign Trade of Greece," "Our Latin American Markets Analyzed," and others.

Firms desiring to receive any of these services should address the Division of Regional Information of the Bureau of Foreign and Domestic Commerce, Washington, D. C.

Purchasing Power of the Dollar Increases

THE purchasing value of the dollar as measured by living costs for the American wage earner and other persons of moderate means, which includes the great majority of the population, today stands higher than it has for more than two years past, according to the National Industrial Conference Board, 247 Park Ave., New York. The dollar is now worth, on the basis of present living costs, 61.1c. compared with the pre-war (1914) dollar. It was lowest in July, 1920, when it stood at 48.9c.

The purchasing power of the dollar has been thus enhanced by the steady decline in average living costs throughout 1925 and 1926, which last April, however, were still 63.7 per cent higher than they had been in 1914, just before the war. But the average weekly earnings of industrial workers, owing to higher wage rates and more steady employment, at present are more than twice as high as they were in 1914, so that in spite of the higher living cost, the wage earner on the average draws weekly pay of about 34 per cent greater purchasing power than he did just before the war. Thus the housewife of the industrial worker who during the period of rapidly rising prices during and immediately after the war asked "Will prices ever come down again?" finds that while prices have stayed on a comparatively high level, the family income in effect goes about a third farther than it did ten years ago.

Electrochemical Society to Visit Wallace and Kellogg

PREPARATIONS are being made for the reception and entertainment of members of the American Electrochemical Society, who will visit Wallace and Kellogg, Idaho, on Sept. 8, traveling from New York to the Pacific Northwest by special train. Many of the members will be accompanied by their wives, and it is announced that altogether there will be 125 in the party. Jerome J. Day, of Wallace, and U. C. Tainton, of Kellogg, both members of the society, will have charge of arrangements at Wallace and Kellogg respectively. In this they will have the co-operation of members of Columbia Section, A.I.M.E., and also of local committees appointed by the commercial bodies of Wallace and Kellogg.

Recent Technical Publications

WAGES IN THE UNITED STATES, 1914-1926. Published by the National Industrial Conference Board, 247 Park Avenue, New York City. Price, $2.50.

The new volume on wages published by the National Industrial Conference Board is the fourteenth publication of that organization dealing with the trend of wages, hours of work and employment. These studies have been progressively broadened in scope from year to year, and this latest affords a comprehensive picture of wage conditions and movements in all important occupational fields. Particular attention has been given in the present study to the relation of the wage situation during 1926 to business and industrial conditions during that year. The very pronounced stability and relatively high level of wages during the last three years, in the face of declining prices, is dealt with as one phase of present conditions especially worthy of study, as indeed it already has attracted attention and stimulated speculation among both foreign and domestic observers of economic trends.

A novel note is struck by the report in the declaration that the contents of the wage earner's envelope in many instances no longer represent his sole income; that, while the worker's wage and his income used to be synonymous, this is no longer universally true. Developments in the field of industrial relations, the report points out, have advanced to such a degree that the many indirect benefits provided for the wage earner in their cumulative effect mean a considerable saving and supplement his income in ways no less tangible, though they may be inconspicuous. Bonuses based on production, quality of work, on attendance, promptness or long service; profit sharing, employee stock ownership, pensions, health, accident and group insurance, and, in some cases, unemployment insurance, co-operative purchasing plans, industrial housing, and transportation at less than commercial rates are some of the benefits cited as examples of supplements to wage incomes. Emphasis is laid on the fact that the average family income is no longer confined to that of one bread winner, as modern business organization has greatly extended opportunities for other members to contribute to the family support, a fact of great significance when cost of living data are studied in connection with income statistics.

This new study of the Conference Board covers wages in agriculture, in the public utilities, in the building trades, and on the railroads, as well as wages in twenty-five important manufacturing industries. The marked stability of wage earnings and rates and of employment generally is pointed out as a fundamental factor in the steady progress of industry and business which during the last three years has been able to expand unhampered by any serious disturbance and under the stimulus of the steady and ample earning power, and, hence, purchasing power, of the working population.

The volume may well be characterized as the most comprehensive study of wage trends and their significance and relation to business conditions based upon the latest data available, and the text is well fortified with many tables and charts covering the period 1914 to 1926, inclusive. R. M. DAVIS.

* * *

A HISTORY OF THE EXPLOSIVES INDUSTRY IN AMERICA. By Arthur Pine Van Gelder and Hugo Schlatter. The Columbia University Press. Price $10.

This volume will surely be widely read outside the industries which actually use explosives, on account of the great interest attaching to the pictures which it presents of a certain phase of the nation's early industrial life and the pioneer spirits connected with it, such as E. I. du Pont de Nemours, Mowbray, and others. The work is in six sections and contains a total of more than 1,100 pages and over 450 illustrations.

The first section deals with the invention and early manufacture of black powder, and the authors point out that it was not really until after the close of the Civil War that the industry began slowly to assume its present-day dimensions. They point out also that the history of the black-powder industry from the end of the Civil War to the present time is not as picturesque as that of the early days, but it is nevertheless a true romance of big business. This section contains detailed histories of the E. I. Dupont de Nemours company, the Laflin and Rand Powder company, and other large producers of the early days.

The nine chapters comprising the second section are devoted to the history of nitroglycerine and dynamite. Nitroglycerine was first made experimentally by Ascanio Sobrero, of Turin, in 1846, but it was not manufactured commercially until Emmanuel and Alfred Nobel began their work in 1861. The pioneer manufacturer in this country was George Mordey Mowbray, to whom the authors dedicate their work. In this section detailed histories are given of the Atlas-Giant group, Hercules group, Du Pont group, and others.

Section III is devoted to the history of blasting supplies. The invention of safety fuse by William Bickford in 1831, percussion caps in 1820, and, somewhat later, electric blasting equipment by Hare and Wheatstone are all touched upon and the evolution of modern appliances from these early inventions is fully described.

In the fourth and fifth sections of their work, the authors deal exhaustively with the history of smokeless powders and military explosives. The book concludes with an admirable last section entitled "Explosives in the Making of America." In a very early passage of the book it is stated that "every improvement in the means of destruction at the command of man has meant a corresponding advance in the civilization and general welfare of mankind." The truth of this assertion is abundantly proved in these last pages.

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TECHNOLOGY AND USES OF SILICA AND SAND. By W. M. Weigel, Bureau of Mines Bull. 266, 1927; Superintendent of Documents, Washington, D. C. Price 40 cents.

Quite a number of state Geological Survey reports contain descriptions of silica and sand deposits within the borders of individual states. Also, many articles have appeared in the technical press on various phases of the sand industries, with descriptions of individual plants, but there has been a notable lack of a single text bringing together between one pair of covers the essential features of production, technology, and uses. To prepare such a text is no easy task, because the natural forms of silica and sand are extremely diversified and the products are utilized in many different industries. Such a compilation has been accomplished with remarkable success by Mr. Weigel in this recent bureau report. The solid or consolidated forms of silica are first described under the headings quartz, quartzite, and sandstone. Of the unconsolidated forms, sand is the most important both in volume of production and in the great variety of uses to which it is applied, such as for structural purposes, molding, glass manufacture, abrasive, filter, furnace, and a number of minor applications. Tripoli, derived from the alteration of cherty limestone, is a fine-grained form of silica used as an abrasive, as foundry parting, and as a filler. Flint and chert are used chiefly as abrasives in the form of tube-mill lining and grinding pebbles. Diatomaceous earth, consisting of accumulations of shells of minute organisms, is used as a filter medium, a heat insulator, as a polishing powder, and for several other purposes. The discussion includes occurrence and distribution, quarrying or mining methods, preparation, utilization, specifications, and methods of testing. Bibliographies and many footnote references direct the reader to books or articles covering distinct localities or dealing with specific phases of the industries in greater detail than would be possible in a general text. The book contains 204 pages and 50 illustrations. OLIVER BOWLES.

HARDENING OF TOOL STEEL—Bulletin No. 38, entitled "The Correct Hardening of Tool Steel," by A. R. Page, has been issued by Automatic & Electric Furnaces, Ltd., 173 Farrington Road, London, England. Copies of the bulletin may be obtained free of charge from the company.

Personal Notes

CHARLES HARDY has returned from a two months' visit in Europe.

H. J. IBBOTSON, consulting engineer, has returned from England to Johannesburg.

L. KNAPP, metallurgical engineer, left Johannesburg on June 18, en route for Europe on a business trip.

O. MCCRANEY is now manager of the Argonaut Gold Mining Company at Jackson, Amador County, Cal.

MR. AND MRS. HARRY H. WEBB have returned to Santa Barbara, Cal., from a journey to South Africa.

MR. AND MRS. FRED HELLMAN are sojourning for three or four months on Belvedere Island, near San Francisco.

W. GEMMILL, general manager of the Transvaal Chamber of Mines, has returned to Johannesburg from Geneva.

J. H. CURLE, mining engineer, has returned to Johannesburg after a motor tour through the Orange Free State and Basutoland.

CARL DAVIS, consulting engineer to the Anglo-American Corporation of South Africa, Ltd., has left Johannesburg for London.

DR. A. W. ROGERS, Director of the South African Geological Survey, has left Pretoria on an official visit to the Pilgrims' Rest district.

CHESTER HOATSON, now manager of the Belmont Copper Co. of Superior, Ariz., was in New York City on business in the last week of July.

FOREST RUTHERFORD, consulting metallurgical engineer, has returned to New York City from a four months' trip to the West on professional business.

JOHN D. RYAN, of New York City, chairman of the board of directors of the Anaconda Copper Mining Co., is visiting in the Michigan copper district.

NICHOLAS LIEPNER and I. J. A. DIAMOND, mining engineer, recently left Johannesburg for the Northern Transvaal Copper Co.'s property, near Messina.

S. F. SHAW, who has been engaged as consulting engineer by the Carter Oil Co. at Seminole, Okla., during the last six months, is taking a vacation at San Antonio.

H. R. ROBBINS was in San Francisco recently on his return from travels in Korea and Japan. He expects to attend the Empire Mining Congress at Toronto in September.

ELLSWORTH Y. DOUGHERTY has gone to Newfoundland on a new mining enterprise for the American Smelting & Refining Co. His address is Bucans, via Millertown Junction, Newfoundland.

A. C. FIELDNER, the engineer in charge of the experiment stations of the U. S. Bureau of Mines, has left Washington for a general inspection trip, during which he will visit all of the Bureau stations.

F. H. BROWNELL, of New York, president of the Federal Mining & Smelting Co., was recently in Wallace, Idaho, for the purpose of visiting the two mines, Morning and Page, operated by the Federal company in the Cœur d'Alene district.

C. H. BAXTER, who recently accepted a professorship as head of the Mining Department of the Michigan College of Mining and Technology, is an engineer well known in mining circles. He was born in Detroit, graduated from the high school there and entered the Michigan College of Mines, from which he received his degrees in 1902. He began mining as assistant engineer under John Harris at the Quincy Mine in 1902, and in 1903-04 was transferred to the Republic Iron & Steel Co. for one year.

PROF. C. H. BAXTER

In 1904-05, as county road engineer for Dickinson County, he built the first county road in northern Michigan. In 1905 he returned to the Michigan College of Mines as an instructor, remained one year, then joined the Jones Exploration Co. and spent a year exploring copper properties for them in the Southwest. He joined the Loretto Mining Co. in Michigan, in 1907, became superintendent of the Loretto mine, and also a director in the company, and remained for twenty years, during which time he was appointed to the Michigan State Tax Commission. Professor Baxter has been engaged prominently in business and civic affairs. He is a past president of the Michigan College of Mines Alumni Association, and at present president of the Lake Superior Mining Institute.

J. M. TIPPETT was, through a regrettable typographical error, given the title of manager of the Portland Gold Mining Co., in connection with his article in the July 30 issue. Mr. Tippett asks us to state that he is manager of the mill only.

R. M. CATLIN, manager of Franklin, N. J., plant of the New Jersey Zinc Co., with Mrs. Catlin and their daughter Helen, will be one of the United States representatives of the mining industries at the Empire Mining and Metallurgical Congress which opens in Montreal on Aug. 22.

SCOTT TURNER, the director of the U. S. Bureau of Mines, complying with a request from the Canadian government, has been designated as the representative of the United States to attend the Empire Mining and Metallurgical Congress.

T. M. HAMILTON recently made a mine examination on Kississing Lake, Flin Flon mineral belt, in the northwest corner of Manitoba. The last leg of his trip was made by hydroplane from the Royal Canadian Air Force flying base at Mile 42, Hudson Bay Railway, to the lake, a distance of 90 miles in 50 minutes' flying time, eliminating a canoe and overland trip of six days each way.

OBITUARY

C. A. GRASSELLI, chairman of the board of directors of the Grasselli Chemical Co., died in Cleveland, Ohio, on July 29.

AUGUSTUS J. DUNSTAN, assistant secretary for the Calumet & Arizona Mining Co., died recently at his home in Calumet, Mich. He entered the offices of the company after completing his studies in school and two years ago was advanced to the position he held at the time of his death. He was thirty-nine years of age.

ALBERT W. HUDSON, leaching expert for the Phelps Dodge Corporation, at Bisbee, Ariz., died suddenly of heart disease on July 14, 1927. Mr. Hudson was fifty-three years old. He had been in charge of the leaching and precipitation plant at the Copper Queen since 1919. Previous to that time he was engaged as research engineer by the corporation. Mr. Hudson was born at Christ's Church, New Zealand, coming to the United States in 1913. From 1908 to 1912 he was employed by the Great Cobar Co., Ltd., in Australia, first as a metallurgist and then as works manager. On coming to the United States in 1913, he accepted a position with the Butte Duluth Mining Co., of Butte, Mont., as superintendent and consulting metallurgist. This he gave up the following year to enter the employ of the Phelps Dodge Corporation. From 1914 to 1919 he performed research work for this corporation in Tyrone, New Mexico; in Douglas, and Bisbee, Arizona. His work laid the basis for the heap leaching and precipitation work now being done by the company at the plant operated in connection with the Bisbee concentrator. Mr. Hudson was regarded by mining and metallurgical authorities as one of the foremost leaching experts in the world. His knowledge and application of the subject was extensive, and many contributions from his pen have appeared in the technical press.

MARKET AND FINANCIAL NEWS

Union Minière Makes $4,500,000 Profit in 1926

THE profit-and-loss account issued by the directors of the Union Minière du Haut-Katanga with their annual report for 1926 is as follows:

Gross profits from operations			B.fr. 170,937,725
Balance from 1925			B.fr. 2,462,379
			B.fr. 173,400,104
Less			
Interest on bonds and preference shares		B.fr. 9,588,000	
Sundry interest and commissions		B.fr. 4,880,508	
Amortization of			
Balance of expenditure in connection with bond issue	B.fr. 1,716,687		
Expenses in connection with extension of concessions	B.fr. 2,000,000		
Preliminary expenses	B.fr. 15,302,459	19,019,147	33,487,655
Balance: Profit			139,912,449

A gross dividend of 220 B.fr. per share was approved, payable on July 15, leaving a balance of 12,129,945.82 B.fr. to be carried forward.

Mining Department

The necessity of economizing in native labor to be able to devote attention to directly productive work made it necessary slightly to curtail the prospecting campaign. Notwithstanding this, 17,321 meters of boreholes were drilled. In this total are included certain very deep holes on the Prince Leopold property and some borings for coal.

Ore reserves on Dec. 31, 1926, were as follows:

	Metric Tons	Per Cent Copper	Metric Tons Copper
Oxidized ores:			
Smelting ores	4,849,642	18.82	913,141
Concentrating and leaching ores	54,000,228	6.41	3,464,435
Sulphide and mixed ore:			
Sulphides	1,550,000	18.00	279,000
Mixed and low-grade ore	16,760,780	3.94	661,277
Totals	77,160,650	6.89	5,317,853
At the end of 1925 the reserves were	76,892,943	6.87	5,285,640

These figures show an increase in the ore reserves in spite of the quantity mined to supply the smelters during the years 1926. The total tonnage of ore mined during the year under review was 1,406,082 tons. Production of individual mines was as follows:

	Metric Tons		Metric Tons
L'Etoile	7,430	Kambove	563,903
Ruashi	422,861	Prince Leopold	119,531
Likasi	134,995	Luushia	99,374
Chituru	9,260	Lukuni	48,728
			1,406,082

The Prince Leopold, Luushia, and Lukuni mines all entered the producing stage during the year under review.

The Panda Mill—During 1926, the Panda mill treated 1,113,963 tons of ore, producing 198,558 tons of concentrate of an assay value of 22.04 per cent copper. The experimental flotation plant operating on mill tailing has served to establish this process for the economical treatment of the ores. The plant dealt with 122,740 tons, producing 19,729 tons of concentrates containing 27.4 per cent copper.

Washing Plants—The washing and sorting plants at Ruashi were started up during the second half of the year, and, with the plant at the Etoile mine, treated 193,487 tons of ore, the product of these two mines. They produced 38,367 tons of ore of 19.70 per cent copper for the smelter and 30,488 tons for concentration at Panda.

The washer at Likasi operated only during the first three months of the year, and was then transferred to Luushia, where it was put in operation at the end of the year.

Metallurgical Operations

At the Lubumbashi smelter, the blast furnaces treated:

	Metric Tons
Concentrates and sinter	382,930
Fluxes: Lime	167,792
Iron ore	80,156
Fuel: Coke	117,819

The sintering plant produced 76,902 tons. The blast furnace plant production was 71,902 tons of metallic copper.

At the reverberatory furnaces, the plant treated:

	Metric Tons
Ore concentrates	31,925
Fluxes: Limestone	12,424
Iron ore	5,012
Fuel	26,642

From the above was produced 7,135 tons of metallic copper.

The experimental leaching plant at Panda treated 10,770 tons producing 1,601 tons of cathode copper.

Total copper production amounted to 80,639.3 metric tons. The following table gives previous annual productions:

	Metric Tons		Metric Tons
1920	18,962	1923	57,886
1921	30,464	1924	85,570
1922	43,362	1925	90,104

The following is a comparative statement showing the monthly outputs for the first six months of 1926 and 1927.

	1926, Metric Tons	1927, Metric Tons
January	6,403	5,887
February	6,374	5,491
March	6,671	6,248
April	6,596	5,477
May	7,103	6,256
June	6,800	6,400
	39,947	35,759

The falling off in production is only temporary. It has been voluntarily accepted to allow of the completion of certain construction work and improvements designed to economize native labor. The starting up of the reverberatory plant justifies the expectation of increased production during the second half of the year.

Other installations having for their object increased efficiency are: A surface and underground plant at Prince Leopold mine; a surface plant at Luushia, Lukuni, and Kisanga mines; a second sintering plant at Lubumbashi; a factory for the manufacture of explosive; (cheddite) at Kakontwe; a house for the white staff at Elisabethville and Panda; and improvements to native quarters and hospitals.

Tin—Cobalt—Radium

During 1926 the Busanga mine produced 711 tons of cassiterite; this was treated at the Société Metallurgique works at Hoboken. Tin production for the period was 662 tons.

Production of cobaltiferous alloys from the electric furnaces at Panda was sufficient to supply the needs of the Oolen refinery, which produced some 300 tons of cobalt as metal, oxide, and various cobalt salts. These products were satisfactorily marketed.

The operations of the radium department have resulted in the sale of about 20 gm. of radium produced at Oolen.

Plant Construction

Construction and assembly of new plant at Panda has been prosecuted actively. The reverberatory plant, with a capacity of 30,000 to 40,000 tons of copper, has progressed satisfactorily and should go into operation in the latter half of 1927.

Construction of the leaching and electrolytic plants was continued to the ex-

tent permitted by available labor forces.

Subsidiary work has also made progress. This includes the installation of two supplementary units of 10,000 kw. each at the power station, the construction of four additional flotation units, and a pulverized coal plant.

STATISTICAL NOTES

CONSOLIDATED MINING & SMELTING Co. of Canada, estimates net profits for six months ended June 30, 1927, at $3,436,287, after depreciation, depletion, taxes, and after deducting $2,297,880 for additions to property, compared with net profit after depreciation, depletion, taxes, and after charging out $677,144 for additions to property, of $5,638,237 in first half of 1926. The smelter at Trail is capable of producing 760 tons of metal daily, according to S. G. Blaylock, general manager. For refined lead, its capacity is 410 tons and for refined zinc, 280 tons daily. Of lead and zinc, its output is about 10 per cent of the world's output of each metal. The daily copper capacity is 70 tons.

MEXICAN PREMIER MINES showed an operating profit of $13,000 as a result of June operations. Certain changes in milling plant have been found necessary, and though these were being made it was only possible to run the mill at half capacity. The company hopes to be milling at full capacity within sixty days. Raymond Guyer, the manager, reports that the ore on the north drift 400-ft. level is 10 ft. wide, with the principal value in silver.

VICTORIA COPPER MINING Co. has called an assessment of 25c. per share, payable Aug. 18. Transfer books will be closed July 29. The last assessment, also 25c., was levied two years ago. Victoria has 100,000 shares, all issued.

BANKA TIN mines will in 1928 produce 310,000 pikuls (18,900 tons) compared with 300,000 pikuls (18,300 tons) in 1927, according to Dutch authorities. Working costs are estimated at 16,765,000 florins, or 652,700 florins more than in 1927, which increase is to be attributed to the lower tin content of the areas to be worked, which means that a larger amount of ore will have to be treated. The cost price is expected to be 58.33 florins per pikul of tin. Receipts are estimated at 53,224,500 florins, calculated at 170 florins per pikul. Allowance is made in these figures for a net profit balance of 33,603,000 florins.

DOME MINES reports earnings for the first six months of the present year of $891,111, before allowance for depreciation. This is an increase of $19,000 compared with a corresponding period in 1926. Last year, when dividends were at the rate of $2,000,000 a year, there was a deficit of more than $100,000 in the first six months' operations, but this year with the dividend cut in half there will be a surplus of $390,000. During the period 266,700 tons were treated, with a total recovery of $7.28 a ton.

CALUMET & ARIZONA MINING Co. reports July copper outputs in tons as follows:

Calumet & Arizona	1866
New Cornelia	2495

Imports and Exports of Ores and Metals in May, 1926 and 1927

Compiled from U. S. Department of Commerce Records

In pounds unless otherwise stated

Imports

	June 1926	June 1927
Antimony		
Ore, Gross weight	609,686	372,168
Ore, Antimony content	579,362	183,924
Liquated regulus or metal	1,847,025	2,257,181
Copper		
Ores, copper content	4,837,468	6,324,120
Concentrates, copper content	2,737,289	7,078,534
Regulus, coarse metal, and cement copper	.....	40,520
Imported from		
Spain	1,095,856	342,039
Canada	2,369,635	4,041,248
Mexico	2,317,700	2,526,513
Cuba	17,248	4,540,000
Chile	1,580,214	1,764,927
Peru	109,898	.....
Other countries	84,206	228,447
Unrefined black, blister, and converter copper in pigs, bars, and other forms	31,841,286	45,659,050
Refined copper	22,058,016	6,135,465
Old and clippings for remanufacture	668,384	736,322
Composition metal, copper chief value	10,096	.....
Brass		
Old and clippings for remanufacture	668,384	564,679
Lead		
Ore and matte	3,806,033	7,916,304
Bullion or base bullion	12,472,143	27,540,081
Pigs, bars, and scrap	896,018	17,735
Babbitt, solder, and other forms, lead content	206,827	28,652
Type metal and antimonial lead, Gross weight	442,220	304,650
Type metal and antimonial lead, Lead content	333,165	117,907
Manganese		
Ore, tons, Cuba, manganese content	.....	.....
Ore, tons, Other countries, manganese content	31,315	36,851
Pyrites, tons	29,140	15,552
Tin		
Ore, tons	16	10
Bars, blocks, and pigs	16,195,919	11,512,349
Imported from		
Netherlands	2,185,372	2,249,232
United Kingdom	4,582,582	3,789,862
British Malaya	7,154,334	4,952,511
China	56,122	.....
Dutch East Indies	291,638	.....
Hongkong	1,729,486	246,880
Australia	112,000	112,000
Other countries	84,385	161,864
Zinc		
Ore, zinc content, Free	.....	250
Ore, zinc content, Dutiable	1,011,099	4,145,655
Blocks, pigs, and old	1,885	.....

Exports

	June 1926	June 1927
Copper		
Ores, concentrates, composition, and unrefined	472,291	214,278
Refined copper in ingots and other forms	77,379,112	74,662,952
Exported to		
Belgium	5,570,712	6,830,307
France	16,085,779	7,739,983
Germany	14,621,211	25,457,062
Italy	9,059,834	5,299,570
Netherlands	5,213,545	7,668,366
Spain	2,183,900	442,001
Sweden	1,883,468	2,210,467
United Kingdom	17,542,842	13,871,736
Other Europe	508,806	594,090
Canada	1,366,877	1,153,932
British India	357	.....
China, Hongkong, and Kwantung	168,177	739,243
Japan	2,723,440	2,322,441
Other countries	500,164	333,754
Old and scrap	2,020,993	3,755,918
Pipes and tubes	222,619	260,402
Plates and sheets	187,225	748,218
Rods	3,285,082	5,404,709
Wire	1,749,226	834,508
Insulated copper wire and cable	1,658,069	1,700,205
Lead		
In pigs, bars, and other forms		
From domestic ores	210,663	271,132
From foreign ores	16,341,389	24,142,864
Exported to		
Belgium	560,107	560,153
France	1,635,595	778,704
Germany	3,024,753	12,290,316
Netherlands	.....	616,163
Sweden	448,099	1,311,228
United Kingdom	1,680,287	2,576,957
Other Europe	224,023	560,159
Brazil	627,554	515,359
Other South America	248,703	988,409
Japan	6,777,830	3,586,066
Other countries	1,325,099	630,482
Other lead manufactures	2,373,712	391,468
Zinc		
Ore and concentrates, tons	8,447	3,200
Dross	2,217,113	815,901
Cast in slabs, blocks, or pigs	10,311,176	10,549,238
Exported to		
Belgium	313,704	257,671
France	1,117,835	1,198,489
Germany	1,323,415	663,485
Italy	336,134	918,493
Netherlands	123,228	152,886
United Kingdom	3,526,093	6,296,407
Other Europe	.....	67,252
British India	291,211	.....
Japan	3,247,198	896,066
Other countries	32,358	98,489
Sheets, strips, other forms	1,647,415	1,525,457
Dust	195,581	141,060
Other zinc manufactures	118,594	108,752

The Market Report

Metal Markets Quiet—Copper, Lead, Zinc and Silver Prices Slightly Off

New York, Aug. 10, 1927—A reaction occurred this week from the activity and strength that have characterized the metal markets recently. The damage done has not been great, however, and with stronger London quotations yesterday and today, sentiment seems improved.

Copper Slightly Easier

Most of the large producers have continued all week quoting 13⅜c. delivered to usual Eastern points of consumption. A fair amount was sold on Thursday and Friday at these prices, but in the last three days this quotation has become almost entirely nominal. Following the recent good buying, and in view of the pronounced drop in London on Monday, most consumers became disinterested, and prices as low as 13.20@13.25c., delivered Valley, were necessary to tempt some of them. Such quotations were not general and some copper sold today as high as 13½c. in the Middle West. Practically all sellers continue firm, with no present intention of revising their prices downward. It is thought that consumers are still underbought. The export association has continued its 13.65c. c.i.f. price all week, but foreign buying has been as quiet as in the domestic market.

Little Change in Lead

The only change in the lead situation is a slight softening of the price in the St. Louis district, where some metal is obtainable at 6.475c. or possibly 6.45c. today. The American Smelting & Refining Co. has maintained its official contract price for New York lead at the 6.75c. level established last week. In some instances a slight premium has been obtained; and on the other hand the price has been shaded by dealers yesterday and today. In the Middle West the leading interest has been at 6.55c. most of the week, although in the last two days 6.50c. has been quoted to regular customers to meet the "outside" market. The actual volume of sales during the week has been fully up to the average, with consumers of all kinds participating. One important seller reports increased buying on the part of storage-battery makers who need metal for prompt delivery. The London market suffered quite a drop on Monday, but has recovered part of the lost ground since then. Prices in the two markets still make it definitely advantageous to sell ore lead from Mexico in this country rather than abroad. Sellers generally are in a comfortable position, and no reason for a definite movement of prices either upward or downward is evident.

Zinc Reasonably Firm

Though the price of zinc has reacted from the high of 6.45c. of a week ago, selling for as low as 6.30c., St. Louis, in the week ending today, a slightly firmer tendency is now noted, with most producers quoting 6⅜c. Sales have been somewhat smaller than those of recent weeks, but producers apparently are not anxious sellers.

The statistics issued by the American Zinc Institute today were encouraging, showing reduced production, increased shipments, smaller stocks at the end of the month, and fewer retorts operating—all of which should make for a stronger market. The following figures are in tons of 2,000 lb.:

Stock, July 1	43,858
Produced	47,627
Shipped	52,162
Stock, July 31	39,323
Shipped from plant for export	4,803
Sold but not delivered, July 31	12,898
Retort capacity, July 31	131,484
Average number retorts operating in July	72,259
Number retorts operating July 31	76,519

Daily Prices of Metals

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
4	13 075@13 15	64 375	65.25	6.75	6.55@6.60	6 375–6.425
5	13 075@13.15	64.75	65 50	6 75	6.575	6.35 @6.40
6	13.075@13.15	64.50	65 25	6.75@6 80	6.55	6.35 @6 40
8	13.025	64.125	65 00	6.75	6 525	6.325@6.35
9	13 05	64 25	65.125	6.75	6 475@6.50	6.30 @6 35
10	13 05	64 375	65.25	6.75	6.475	6.35 @6 40
	13 077	64 396	65 229	6 754	6.531	6.365

Average prices for calendar week ending Aug. 6, 1927, are: Copper, 13.090; 99 per cent tin, 64.417; Straits, 65.250; N. Y. lead, 6.729; St. Louis lead, 6.533; zinc, 6.402; and silver, 55.583.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there the other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
4	56⅜	56¾	62¾	297	289	24 5/16	24¾	29¼	29
5	56 1/16	56½	62½	299½	290⅝	23⅞	24 7/16	29 1/16	28 13/16
8	55½	55⅞	62	295½	287½	23 1/16	23 9/16	28½	28 7/16
9	55½	55⅞	62	296¼	288½	23 3/16	23 11/16	28⅜	28 5/16
10	55¾	56 1/16	62¾	297	288½	23½	24	28½	28⅝

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Aug.	Sterling Exchange "Checks"	Silver		Gold London	Aug.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
4	4.85⅜	55⅜	25 9/16	84s10½d	8	4.85½	54⅛	24 15/16	84s10½d
5	4.85⅜	55⅜	25 9/16	84s10½d	9	4 85⅝	54⅜	25	84s10¼d
6	4.85⅜	54⅞	25 7/16	.....	10	4 85⅝	54½	25¼	84s10½d
					Avg.		54.771		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Tin Quiet and Steady

Tin eased in both the foreign and domestic markets on Monday, but closes the week with Straits in New York slightly higher than a week ago. Consumers have bought in moderate quantity. Dealers, likewise, have been in the market. The premium of Straits over 99 per cent is narrower than it was a month ago, because the lower-grade metal is not so plentiful for prompt delivery as it had been. October delivery is quoted at only about ¼c. under prompt.

Silver Weak and Lower

During the first half of last week the silver market held fairly steady but suffered another sharp decline on Aug. 8 of ½d. in London and ¾c. in New York. London has shown some improvement today, advancing ¼d. to 25¼d. on purchasing for Chinese account. The New York market has not correspondingly followed London, advancing only ⅛c. over yesterday's price. The market closes quiet and uncertain.

Mexican Dollars (old Mexican pesos): Aug. 4th and 5th, 41⅜c.; 6th, 41⅜c.; 8th, 40⅝c.; 9th, 40⅞c.; 10th, 41c.

Sterling Touches New High

The feature of foreign exchange was the strength of sterling, which reached a new high for the year. Other closing cable quotations on Tuesday, Aug. 9, were: francs. 3.92c.; lire, 5.4425c.; and marks, 23.77¼c.; Canadian dollars ⅛ per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

ALUMINUM—Per lb. 98 or 99 per cent grade, price of leading interest, 26c.; outside market, 25.30@25.80c.

ANTIMONY—Per lb., duty paid. New York: Chinese brands, range for the week, spot business, 12c. September arrivals ⅛c. higher. Market quiet. Cookson's "C" grade, spot, 17¾c. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, 16½c.

BISMUTH—Per lb., New York, in ton lots, $1.85@$2.10. London, 8s.

CADMIUM—Per lb., New York, 60c.

IRIDIUM—Per oz., $107@$110 for 98 @99 per cent sponge and powder.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal.

PALLADIUM—Per oz., $52@$54. Small lots bring up to $58. Pure metal as a constituent of crude platinum, nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Dealers and refiners quote the trade for refined metal, per oz., cash, $64@$65.50. Market dull and narrow. Pure metal as a constituent of crude platinum, at $62. Continues very dull.

QUICKSILVER—Per 76-lb. flask, range for week $120@$119, nominal. Market shows little life. San Francisco wires $121.33. London, £20¾@£22.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Aug. 6.

Metallic Ores

MANGANESE ORE—Per long ton unit of Mn. c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian, washed, 53@55 per cent, 40c. Chemical grades unchanged from quotations in the Aug. 6 issue.

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $10.25@$10.50. Western scheelite, $10.75@$11. Market dull and prices largely nominal.

Chrome, Iron, Molybdenum, Tantalum, Titanium, Uranium, and Vanadium Ores are unchanged from quotations in the Aug. 6 issue.

Lead Up—Zinc Up and Down

Joplin, Mo., Aug. 6, 1927.

Zinc Blende	Per Ton
High	$44.70
Premium Blende, basis 60 per cent zinc	$44.00@45.00
Prime Western, basis 60 per cent zinc	43.00@44.00
Fines and slimes, 60 per cent zinc	40.00@42.00
Average settling price, all zinc	39.80

Galena	
High	$85.70
Basis 80 per cent lead	85.00
Average settling price, all lead	82.80

Shipments for the week: Blende, 13,109; lead, 937 tons. Value, all ores the week, $599,250.

In midweek buyers were offering $44 basis Prime Western, but offerings today returned to the $43 basis price of last week. The larger portion of this week's purchase was made on the higher offering, as many sellers declined to accept the price today. The purchase was 15,070 tons.

Lead was again advanced $2.50 per ton, and sellers are still slow to dispose of reserve stocks, totaling approximately 11,000 tons.

Production is now slightly above 13,000 tons per week, showing an increase of 760 tons of reserve stock for the week. The unsold tonnage in bins is scarcely sufficient to prevent a sharp upward price movement should demand largely increase.

Platteville, Wis., Aug. 6, 1927.

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$45.75

Lead Ore	
Lead, basis 80 per cent lead	$85.00

Shipments for the week: Blende, 1,383 tons; lead, 80 tons. Shipments for the year: Blende, 40,176; lead, 1,050 tons. Shipments for the week to separating plants, 2,410 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the Aug. 6 issue.

Mineral Products

ARSENIOUS OXIDE (White Arsenic)—Per lb., 4c. Fair buying. London, Cornish white, per long ton, £16½@£16¾.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Aug. 6 issue.

Ferro-Alloys

FERROCHROME—Per lb. of contained chromium, 60@70 per cent chromium, 4@6 per cent carbon, 11@11½c.

FERROMANGANESE—Per long ton, domestic and foreign, 78@82 per cent, $90, furnace, for delivery during second half 1927. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent, 96@98c. f.o.b. works. Dull.

Ferrocerium, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from prices in the Aug. 6 issue.

Metal Products

ROLLED COPPER—Per lb., f.o.b. mill, sheets, 21¾c.; wire, 15½c.

LEAD SHEETS—Per lb. full rolled, 10¼c.; clipped, 10½c.

NICKEL SILVER—Per lb., 28¾c. for 18 per cent nickel Grade A sheets.

YELLOW (MUNTZ) METAL—Per lb., dimension sheets, 19¼c.; rods, 16½c.

ZINC SHEETS—Per lb., f.o.b. mill, 10c.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the Aug. 6 issue.

No Increase in Steel Activity

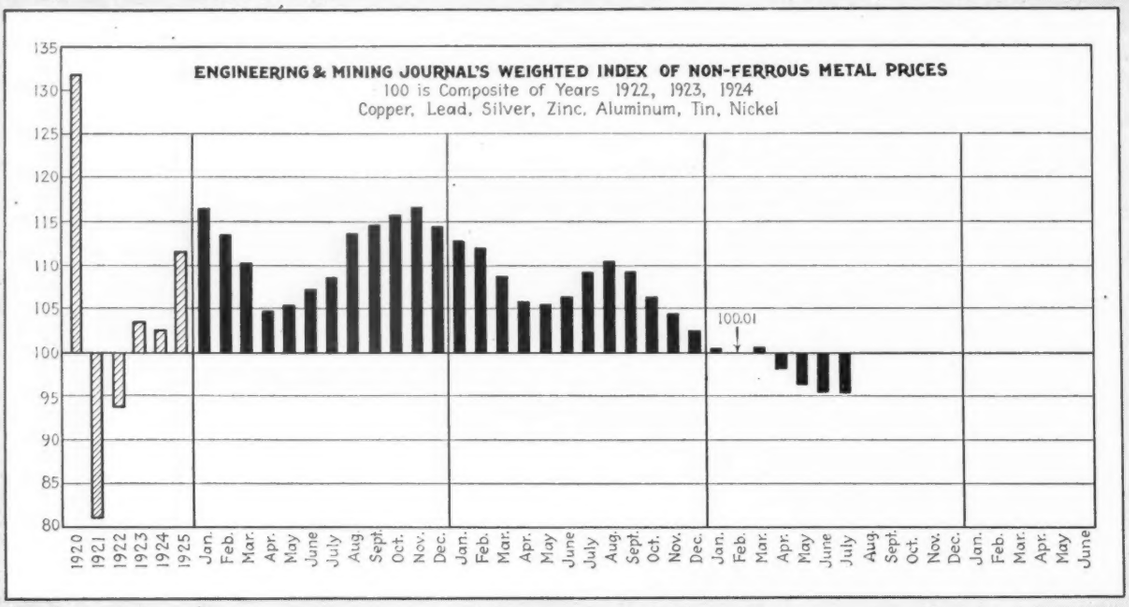
Pittsburgh, Aug. 9, 1927

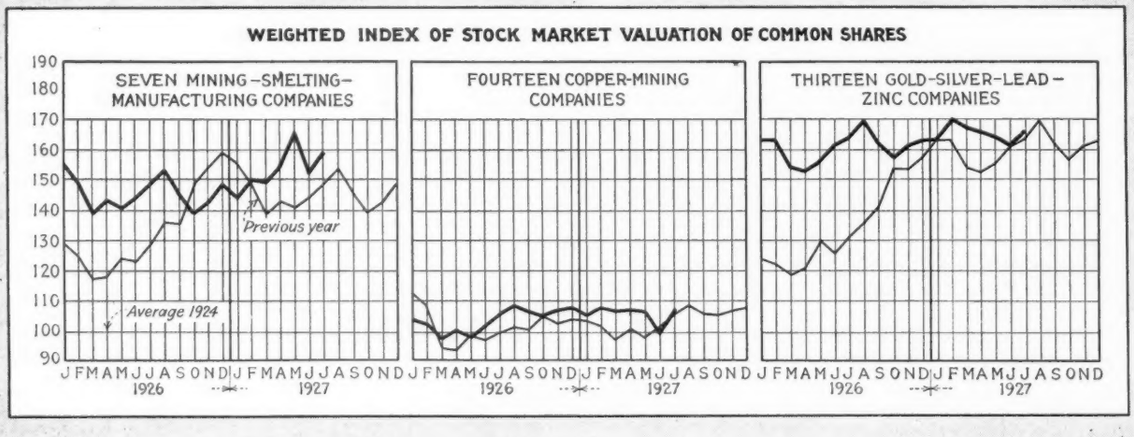
Business in general appears to be in a slightly depressed state, and the railroads are light buyers except in bridges and other fabricated steel work. The automobile trade has not had its usual seasonal pick-up, various new models being still to be gotten into heavy production.

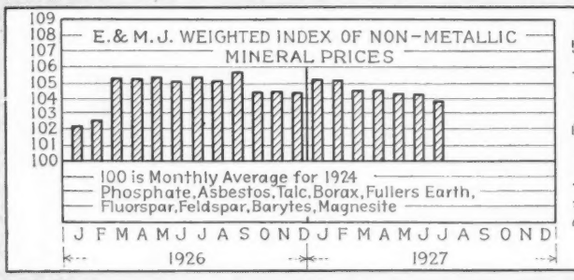
Pig Iron—The Valley market continues dull as to new buying, and shipments scarcely measure up to the limited production. Prices have been unchanged since the decline late in June, at $18.50 for bessemer, $17.50 for basic, and $18 for foundry iron, f.o.b. Valley furnaces.

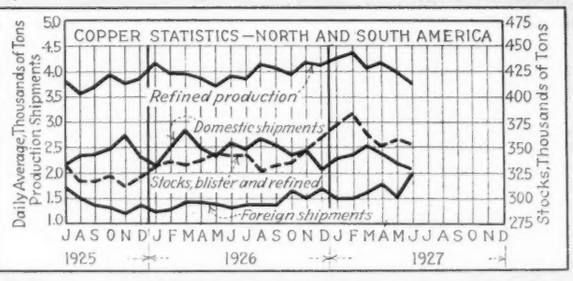
Connellsville Coke—The spot furnace coke market is slightly stronger, at $3@$3.15 against $3 quotable for several weeks. Spot foundry remains at $4@$4.75, buying continuing at a low rate.

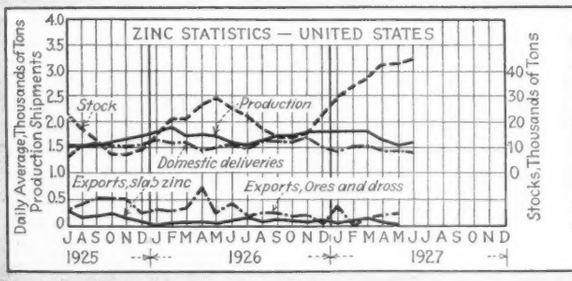
E.&M.J. Statistics of the Mining Industries

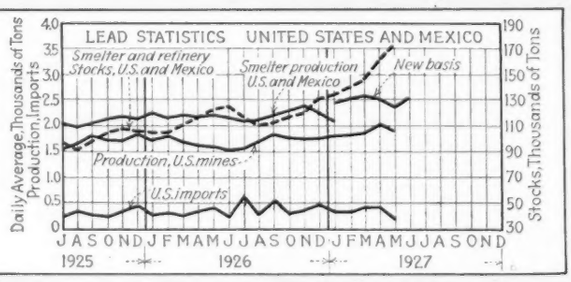





E.& M.J. WEIGHTED INDEX OF NON–METALLIC MINERAL PRICES
100 is Monthly Average for 1924
Phosphate, Asbestos, Talc, Borax, Fullers Earth,
Fluorspar, Feldspar, Barytes, Magnesite
1926
1927







Review of Current Statistics

By A. B. PARSONS
Associate Editor

IN SPITE OF THE FACT that *Engineering and Mining Journal's* Weighted Index of Non-Ferrous Metal Prices suffered a further small decline—from 95.55 in June to 95.42 in July—and reached the lowest point touched in more than four years, the situation in the metal markets at the moment is brighter than it has been for many months. For one thing, copper, the bell-wether of the group, has turned upward, price-wise. The average for July was 12.52c., compared with 12.37c. in June. The zinc average also rose slightly. Had it not been for a material decline in tin, which is subject in marked degree to speculative influences both abroad and in the United States, and which in any event has little direct bearing on the current income and profits of mining companies, the Index number would have been higher rather than lower. This would have been so in spite of a moderate decline in silver and lead.

A more accurate picture of the situation is reflected in the following table:

Metal Prices in Cents per Pound

	Copper	Lead	Zinc
July 1	12.225	6.40	6.15
July average	12.532	6.344	6.229
Aug. 10	13.05	6.75	6.375

The improvement in copper is particularly significant. It is ascribed in most quarters to the active buying in Europe. Buyers on the other side appear to have taken cognizance sooner than consumers in the United States, of the fact that world's aggregate stocks of copper in the hands of producers have been gradually declining, as a consequence particularly of the shrinkage of supplies in countries other than North and South America. Evidently this realization, coupled with the comparatively low price and active consumption abroad, started a wave of buying. Domestic consumers likewise entered the market, though with a less avid appetite than Europeans displayed. The c.i.f. price was marked up by Copper Exporters, Inc., in close step with the advances in the domestic market, so that buyers on neither side could complain, with reason, that they were being discriminated against.

An encouraging feature from the producer's point of view is the confidence displayed by all the sellers. Heretofore this year under somewhat similar circumstances some seller or sellers have weakened and commenced cutting the price, with unfortunate, though quite natural, results.

UNLIKE COPPER, lead seems to have received its major stimulus from domestic buying. The position fundamentally does not seem to have changed much, as to the rate either of production or of consumption. However, the beginning of an upward trend following a long decline is always attended with brisk demand on the part of buyers.

***E.&M.J.* Weighted Index of Non-Ferrous Metal Prices**

100 Is Composite for 1922-3-4

1920	130.92
1921	80.80
1922	93.94
1923	103.43
1924	102.63
1925	111.74
1926	107.74

	1925	1926	1927
January	116.38	112.66	100.46
February	113.50	111.91	100.01
March	110.20	108.95	100.84
April	104.75	105.93	98.63
May	105.34	105.43	96.41
June	107.19	106.68	95.55
July	108.81	109.08	95.42
Average first seven months	109.45	108.66	98.19

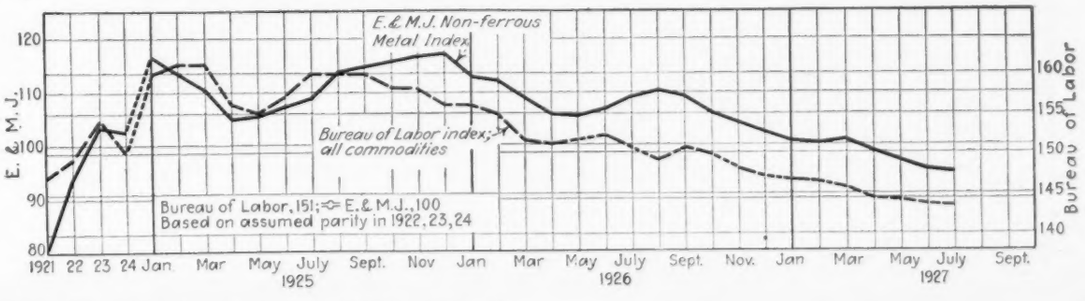
Unless an entirely unforeseen reversal in the trend should take place in the second half of August, the Weighted Index will show definite improvement, following almost a year of decline that has been uninterrupted if the slight advance in March is excepted. The chart on the opposite page shows that the Index usually fluctuates in long swings. Perhaps July will prove to be the bottom of a good-sized trough. The accompanying graphic comparison between the *E. & M. J.* Index and the "all-commodity" number of the U. S. Bureau of Labor Statistics reveals a marked similarity in the shape of the two curves.

Small declines in prices for feldspar and barytes contributed to a further recession in the Weighted Index of Non-Metallic Mineral prices. The figure for July is 103.93, compared to 104.29 in June.

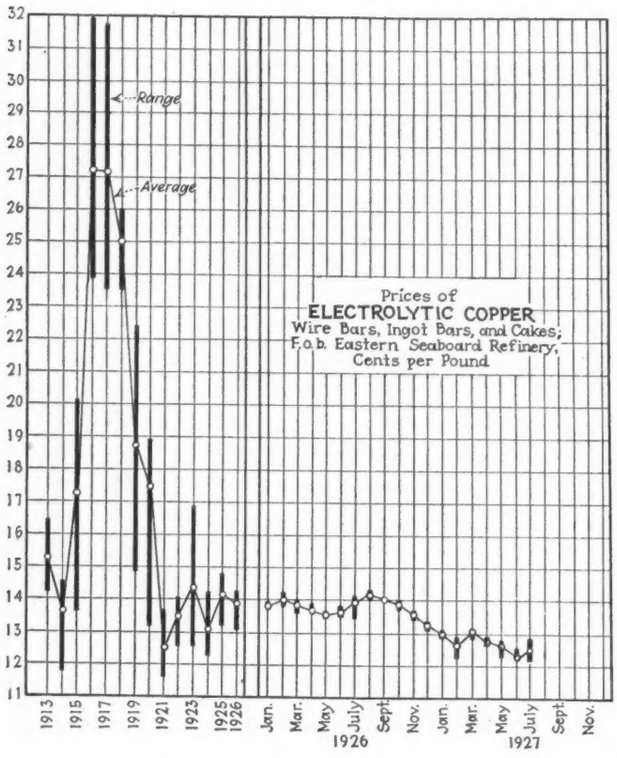
The closing days of July saw Wall Street reveling in stock-market prices that in many instances were all-time highs. A long list of industrial and miscellaneous shares showed an average increase of nearly 20 points during July. This advance was shared qualitatively, though not quantitatively, by stocks in mining companies. In the first group—the mining - smelting - manufacturing companies — International Nickel was the only one that did not advance. Nickel had been pushed in June until a decline was due. The biggest increase was in Anaconda, which doubtless enjoyed some of the effects in the improved sentiment for the "coppers," although it is not very accurately categoried as a copper-mining enterprise. American Smelting & Refining Co. and National Lead also experienced a good advance and the others improved in lesser amounts.

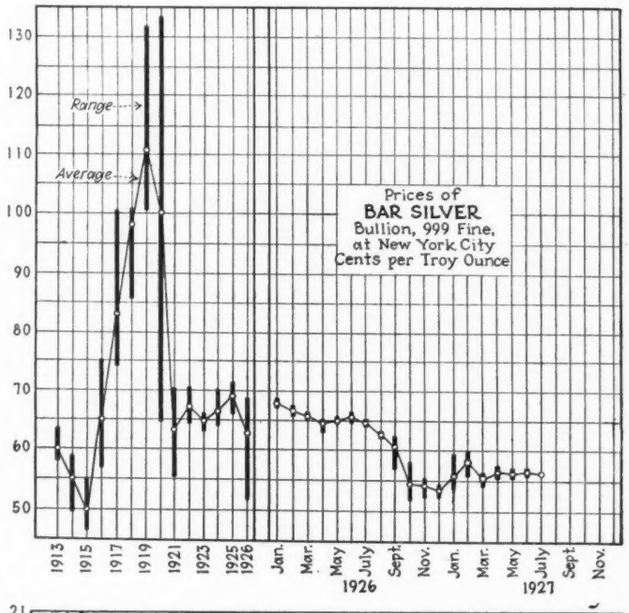
IN THE COPPER group, Quincy, among the fourteen included in calculating the Index number, was the only one to taper. Kennecott and Chile were of course the big factors in the increase because of their relative size; but some of the smaller ones did very well. Inspiration, which has been a weak spot for several months, came back with a big advance. Others were Calumet & Hecla, Nevada Con., New Cornelia, Calumet & Arizona, Miami, and Granby. The buoyant condition of the stock market in general, and the advance in the price of the metal, carried the entire list of copper stocks upward. At the same time the relative position of the curve contrasted with those for the other two groups reflects the comparative low regard in which copper shares have been held in recent years.

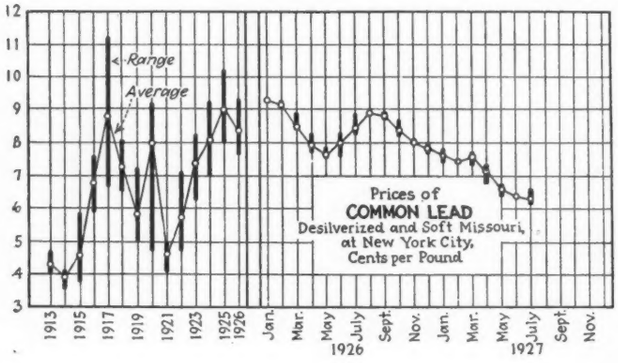
In the gold-silver-lead-zinc group Hollinger, Homestake, and Cresson, gold producers in three distinct regions, were the only stocks to decline—and the declines were not serious. Coincidence, rather than any bearish influences affecting gold mining, is probably the reason. The lead-silver producers in the Rocky Mountain States each advanced, as did St. Joe, owner of the world's largest lead mine.

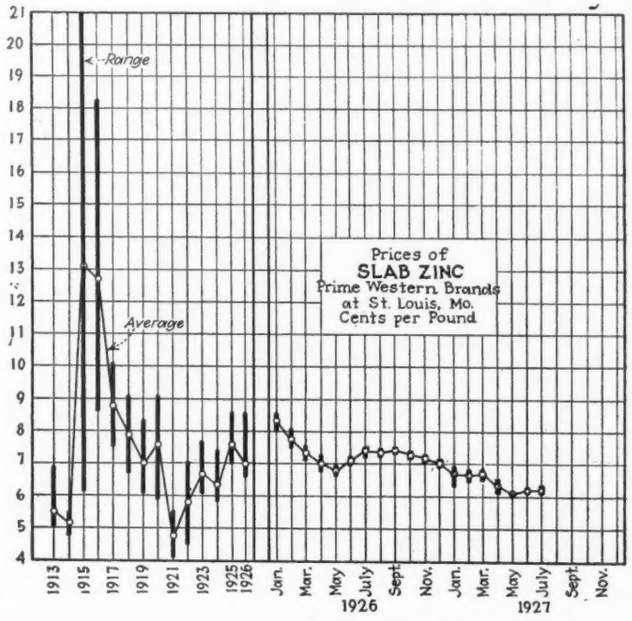


Metal Price Curves

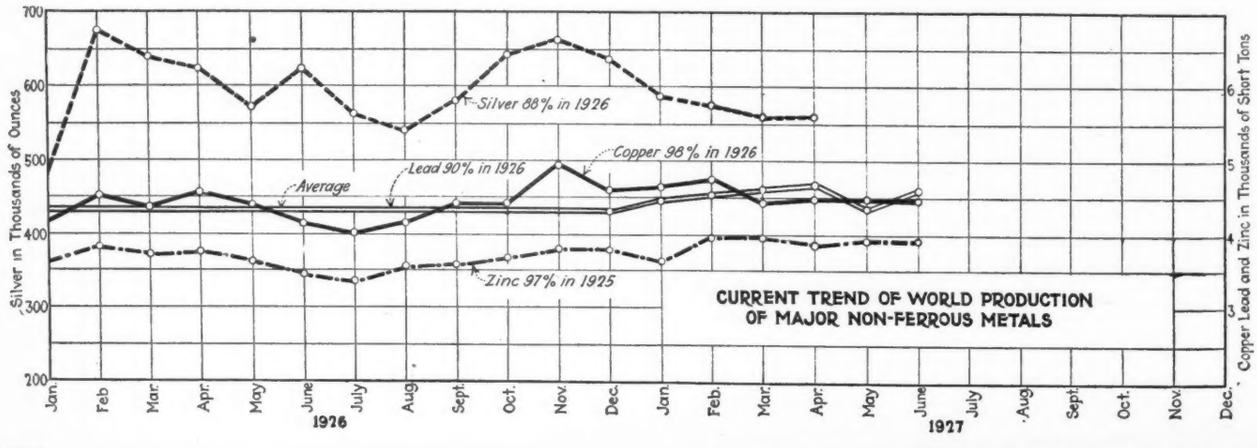








THE CURVES below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output according to the latest estimates of the American Bureau of Metal Statistics. The figures represent production from countries that produce approximately 98 per cent of the world's copper, 97 per cent of the zinc, 90 per cent of the lead, and 88 per cent of the silver. The figures for lead on the new basis are not available for the individual months of 1926; and accordingly a horizontal line showing the monthly average reduced to a daily rate is shown. Delay in receipt of statistics from Mexico accounts for the failure of the silver curve to be up to date.



Mining Stocks—Week Ended Aug. 6, 1927

Stock	Exch.	High	Low	Last		Last	Div.
COPPER							
Anaconda	New York	47⅛	45⅞	46⅜	Jy.16, Au.22	Q	0.75
Arcadian Consol.	Boston	*35	*25	*35			
Ariz. Com'l	Boston	6⅛	6	6⅛	Jy. 18, Jy. 30		0.25
Calaveras	N. Y. Curb			1⅜			
Calumet & Arizona	New York	70½	68½	70	Ju. 13, Ju. 20	Q	1.50
Calumet & Hecla	Boston	16⅛	15⅝	16⅛	Au. 31, Se.15	Q	0.50
Cerro de Pasco	New York	63⅞	60⅜	63⅛	Jy.14, Au.1	Q	1.00
Chile Copper	New York	37½	35⅜	36⅛	Se. 2, Se. 30,	Q	0.62½
Con. Coppermines	N. Y. Curb	2⅞	2⅜	2⅜			
Copper Range	Boston	14⅜	14	14⅛	Ap.2, My.2,	A	1.00
Crystal Copper	BostonCurb	*49	*43	*48			
East Butte	Boston	1⅞	1⅜	1⅞	Dec., 1919		0.50
Granby Consol	New York	40⅛	38⅜	39⅞	Jn.15 Jy. 1	Q	1.00
Greene Cananea	New York	68⅛	61⅛	62⅜	Nov., 1920		0.50
Howe Sound	New York	39	37⅛	39	Apr.1,Apr.15	Q	1.00
Inspiration Consol	New York	21⅞	16⅜	21⅞	Ma.17, Ap.4,	Q	0.25
Iron Cap	Boston Curb			1⅛			
Isle Royale	Boston	11	10	11	Fe.4, Fe.19,	Q	0.50
Kennecott	New York	69	65½	67⅜	Ju. 3, Jy. 1	Q	1.25
Magma Copper	New York	37⅛	35½	37⅛	Jn.30, Jy.15,	Q	0.75
Mason Valley	N. Y. Curb	*90	*80	*90			
Miami Copper	New York	15⅛	14⅜	15⅛	Au.1, Au.15	Q	0.37½
Mohawk	Boston	44⅛	40	41	Jy.30, Se.1	Q	1.00
Mother Lode Coal	New York	2⅞	2⅜	2⅞	Jn.10, Jn.30		0.25
Nevada Consol	New York	14⅜	14	14⅛	Jn. 3, Jn. 7	Q	0.37½
New Cornelia	Boston	22	21⅛	21⅛	Au.5, Au.22	Q	0.50
Noranda	N. Y. Curb	21⅞	21⅛	21⅛			
North Butte	Boston	1.12½	1.00	1.12½	Oct., 1918		0.25
Ohio Copper	N. Y. Curb	1⅜	1⅛	1⅛	Sept. 1926		0.03
Old Dominion	Boston	13⅛	13	13⅛	Dec., 1918		1.00
Phelps Dodge	N. Y. Curb	115	114	115	Jn.18, Jy.1	Q	1.50
Quincy	Boston	17	14⅞	16	March, 1920		1.00
Ray Consolidated	New York	15	15	15	Ap.20, Ap. 30		0.25
St. Mary's Min. Ld.	Boston	23	21⅛	22⅛	Fe.10, Ma.10		2.00
Seneca Copper	New York	1⅞	1⅜	1⅜			
Shattuck Denn	Boston Curb	5⅜	4⅞	5⅜			
Tenn. C. & C.	New York	9⅛	8⅛	9⅛	My.31,Ju.15,	Q	0.12½
United Verde Ex	N. Y. Curb	24⅛	23⅛	24⅛	Jy.6, Au.1	Q	0.75
Utah Copper	New York	119⅜	119⅛	119⅜	Jn. 17, Jn. 30	Q	1.50
Utah Metal & T	Boston	1⅛	1	1⅛	Dec., 1917		0.30
Walker Mining	Salt Lake			*55			
NICKEL-COPPER							
Internat. Nickel	New York	68⅛	61	63⅛	Jn. 16, Jn. 30	Q	0.50
Internat. Nickel pfd.	New York			109	Ap. 14, My. 2	Q	1.50
LEAD							
Gladstone Mtn	Spokane	*23	*19	*21	June, 1927		0.005
National Lead	New York	114⅛	111⅛	111⅛	Se. 16, Se. 30	Q	1.25
National Lead pfd.	New York			132	Se.1, Se. 30	Q	1.75
St. Joseph Lead	New York	42	40⅛	40⅞	Se.10,Se.20,	QX	0.75
ZINC							
Am. Z. L. & S.	New York	7	7	7	May, 1917		1.00
Am. Z. L. & S. pfd.	New York	41⅞	41	41⅜	Nov., 1920		1.50
Butte C. & Z.	New York	4⅛	4⅛	4⅛	De. 9, De. 24		0.50
Butte & Superior	New York	9⅝	9⅛	9⅛	Jn. 17, Jn. 30	Q	0.50
Callahan Zn-Ld	New York	1⅜	1⅛	1⅛	Dec., 1920		0.50
Consol.Lead&Zinc'A'	St. Louis	12⅜	12⅛	12⅜	Ma.15, Ap.1	Q	0.25
Eagle-Picher	Cincinnati	27	26⅛	27	Au.15, Se.1	Q	0.40
Eagle-Picher pfd.	Cincinnati			116	Jn.30, Oc.15	Q	1.50
New Jersey Zn.	N. Y. Curb	186	184	186	Jy.20,Au.10	QX	2.00
United Zinc	N. Y. Curb			*55			
Yellow Pine	Los Angeles	†*33½	†*30	....	Dec. 1925	Q	0.04
GOLD							
Alaska Juneau	New York	1⅛	1⅛	1⅛			
Argonaut	Toronto	*33	*30	*32½			
Barry-Hollinger	Toronto	*30½	*29½	*30½			
Consol W. Dome L.	Toronto	11	10	10			
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	Ma.31,Ap.10	Q	0.10
Dome Mines	New York	7⅛	7	7	Jn.30, Jy. 20	Q	0.25
Golden Cycle	Colo.Springs	1.70	1.69	1.69	My.31, Jn.10	Q	0.04
Hollinger Consol.	Toronto	18.35	18.25	18.25	Jn. 27, Au. 12	Q	0.10
Homestake Mining	New York	61½	61	61⅛	Au.21, Au. 25	M	0.50
Kirkland Lake	Toronto	1.70	1.45	1.61			
Lake Shore	Toronto	20.55	20.25	20.25	Jn.1, Jn.1	X	0.20
McIntyre-Porcupine	New York	25¼	25⅛	25⅛	Au.1, Se.1	Q	0.25
Portland	Colo.Springs	30	30	30	Ap.6, Ap.15,	Q	0.02
Rand Mines	New York	45⅛	45⅛	45⅜	Au.23-30	Am.Sh.	1.52
Teck-Hughes	Toronto	8.50	8.35	8.45	Jy.21, Au.1		0.10
Tom Reed	Los Angeles			*45	Dec., 1926		0.02
Tough-Oakes	Toronto	*30	*25	*25			
United Eastern	N. Y. Curb			*44	July, 1924		0.05
Vipond Cons.	Toronto	*79	*70	*70	Apr.1, Apr.15		0.03
Wright-Hargreaves	Toronto	6.09	6.00	6.05	Jy.15, Au.1		0.05
GOLD AND SILVER							
Carnegie Metals	Pittsburgh	13⅛	13⅛	*13⅛			
Con. Cortes	N. Y. Curb			*19			
Con. Virginia	San Francisco	*2⅛	*2⅛	*2⅛			
Dolores Esperanza	N. Y. Curb			*50	July, 1923		0.05
Premier Gold	N. Y. Curb	2 5/16	2⅛	2 5/16	Jn. 14, Jy. 5		0.08
Tonopah Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Ma.15, Ap.4		0.08
Tonopah Extension	N. Y. Curb			*51	Apr. 1925		0.05
Tonopah Mining	N. Y. Curb	2⅛	2⅛	2⅛	Ma.31, Apr.21		0.07½
West End Consol	N. Y. Curb			*7	Mar., 1923		0.05
Yukon Gold	N. Y. Curb			*45	June, 1918		0.02
SILVER							
Beaver Consol	Toronto	1.27	1.06	1.20	May, 1920		0.03
Castle-Trethewey	Toronto	*76	*75½	*76			
Coniagas	Toronto	5.00	4.20	4.99	May, 1924		0.12½
Keeley	Toronto	*95	*93	*95	Fe.28, Ma.15	X	0.12
Lorrain Trout Lake	Toronto	*56	55	*55	July, 1925		0.05
McKinley-Dar.-Sav.	Toronto	*15	*15	*15	Oct., 1920		0.03
Mining Corp. Can.	Toronto.	3.12	3.09	3.10	Jn. 29, Jy.15		0.12½
Nipissing	N. Y. Curb.	5⅛	5⅛	5⅛	Jn.30, Jy.20		0.07½

Stock	Exch.	High	Low	Last		Last	Div
SILVER-LEAD							
Ahumada	New York	3⅞	3⅛	3⅜	Ma. 25,Ap.4,	QX	0.12½
Bingham Mines	Boston	49⅛	45	49	Jn.27, Jy. 5	Q	1.00
Bunker Hill&Sullivan	N. Y. Curb	104	98⅞	101⅛	Jy. 30, Au.4	X	0.75
Cardiff M. & M.	Salt Lake	*43	*41	*41	Feb. 5, 1927		0.10
Chief Consol.	Salt Lake	2.75	2.70	2.70	Nov., 1926	Q	0.10
Consti'nMng.&Mill'g	Spokane	*30	*26	*27			
Erupcion	Boston Curb	*95	*64	*95	Jn. 25, Jy. 5	Q	0.07½
Eureka Lily	Salt Lake	1.40	1.37½	1.40			
Federal M. & S.	New York	1.60	1.60	1.60	Jn.25, Jn.29	Spec.	$10
Federal M. & S pfd.	New York	95	95	95	My.25, Ju.15	Q	1.75
Hecla Mining	N. Y. Curb	11	10⅞	11	My.4, Ju. 15	Q	0.25
Highland-Surprise	Spokane	*12¼	*11⅛	*12			
Iron King Mining	Salt Lake	*51	*50	*51			
Keystone Mining	Salt Lake	†*27	†*15		Au. 12, Au. 26		0.07½
Lucky Jim	Spokane	*18¼	*18	*18¼			
Lucky Tiger-Com.	Kansas City	7.10	6.85	7.10	Au.4, Au.20		0.05
Mammoth Mining	Salt Lake	1.65	1.65	1.65	Jn.10, Jn.20	Q	0.05
Marsh Mines	Spokane	1.00	1.00	1.00			
North Lily	Salt Lake	3.62½	3.50	3.62½			
Park Utah	New York	6¾	6½	6¾	Jn. 25, Jy. 1	Q	0.20
Plutus Mining	Salt Lake	1.95	1.90	1.90	Jy. 10, Jy. 15	Q	0.10
San Rafael	San Francisco			*24			
Silver King Coal.	Salt Lake	8.40	8.15	8.40	Jn. 20, Jy. 1	Q	0.25
Silversmith	Spokane	*29	*27	*27	Oct., 1926	Q	0.02
Strattons Mines	Spokane	*51½	*50	*50			
Sunshine M. Co.	Spokane	1.30	*94	1.30			
Tamarack-Custer	Spokane	*27	*25	*26½	Sept., 1924		0.25
Tintic Standard	Salt Lake	13.10	12.62½	13.00	Jn.15, Jn.28		0.40
Utah-Apex	Boston	5⅛	5	5⅛	Oct., 1926		0.25
IRON							
Bethlehem Steel	New York	59	53	57⅞	Se. 2, Oc. 1.		1.75
Cleveland-Clifis Iron	Cleveland	115	95	110	Jy. 15, Jy. 25	Q	1.00
Colorado Fuel & Iron	New York	89⅛	82⅛	83⅜	May, 1921		0.75
Gt. North'n Iron Ore	New York	19⅜	18⅛	18⅛	Dec. 6, Dec. 28		0.75
Inland Steel	New York	54⅜	52¼	54⅛	Au. 15, Se. 1	Q	0.62½
Replogle Steel	New York			12⅛			
Republic . & S.	New York	71⅛	67⅛	70	Au. 15, Se. 1	Q	1.00
Republic I. & S. pfd.	New York	104	104	104	Se. 15, Oc. 1	Q	1.75
Sloss-Sheffield S. & I.	New York	127	125½	126	Jn. 10, Ju. 20	Q	1.50
Sloss-Shef. S.&I. pfd.	New York			107⅛	Jn. 20, Jy. 1	Q	1.75
U. S. Steel	New York	138⅛	132⅛	133¼	Au. 30, Se. 29	Q	1.75
U. S. Steel, pfd.	New York	134⅛	133	134	Au. 1, Au. 30	Q	1.75
Virginia I. C. & C.	New York	40	40	40	Jan., 1924		1.50
Virginia I.C.&C. pfd.	New York			60⅛	Ju. 15, Jy. 1		2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN							
De Beers Consol.	New York			27⅛	Jn. 26, Jn.30		1.45
So. Am. G. & P. New.	N. Y. Curb	2⅛	2⅛	2⅛			
Alum. Co. of Amer.	N. Y. Curb	92	87⅛	90			
Alum. Co. ofAmer.pf.	N. Y. Curb	103⅛	102⅛	103⅛	Jn. 15, Jy. 1	Q	1.50
Vanadium Corp.	New York	49⅛	48	49	Au. 1, Au. 15	Q	0.75
Patino M. & E.	New York	22	18⅛	21	Ap. 27, My. 5		1 ab.
ASBESTOS							
Asbestos Corp.	Montreal	24	22⅜	23⅛	Jan., 1926		1.50
Asbestos Corp. pfd.	Montreal	88⅛	87⅛	88	Jn.30, Jy.15	Q	1.75
SULPHUR							
Freeport, Texas	New York	77⅛	73⅜	74⅛	Jy. 15, Au.1	QX	1.25
Texas Gulf	New York	68⅛	65⅛	67½	Ju. 1, Ju. 15	Q	1.00
MINING, SMELTING, REFINING AND GENERAL							
Amer. Metal	New York	46⅜	39⅛	44⅜	Au.20, Se.1	Q	0.75
Amer. Metal, pfd.	New York	111⅛	110⅛	111⅛	Au.22, Se.1	Q	1.75
Amer. Sm. & Ref.	New York	172⅛	165⅛	166⅜	Jn.8, Au. 1	Q	2.00
Amer. Sm. & Ref. pfd.	New York	130⅛	130	130	Au. 1, Se. 1	Q	1.75
Consol. M. & S.	Montreal	235	225	226	Jn. 30, Jy. 15	X	6.25
Newmont Mining	N. Y. Curb	88⅛	87½	88	Jn.30, Jy.15	Q	1.00
U. S. Sm. R. & M.	New York	42	35⅞	40⅛	Jy. 6, Jy. 15	Q	0.87½
U.S. Sm. R.&M. pfd.	New York	49	48⅛	49	Jy. 6, Jy. 15	Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED JULY 30, 1927

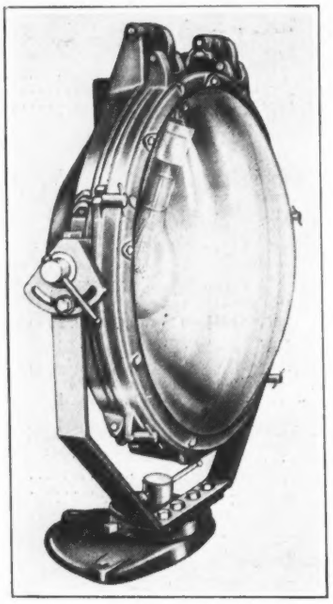
Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	81/3	77/6	80/—	Aug., 1927	5 p.c. (†)
British Platinum (£1)	2/—	1/6	2/—	Feb., 1925	2½ p.c.
Burma Corpn. (10 rupees)	14/1½	13/7½	13/10½	Aug., 1927	6 annas*
Bwana M'Kubwa (5s)	5/6	5/—	5/—		
Camp Bird (2s)	4/6	4/—	4/—		
El Oro (£1)	3/9	3/4½	3/6	Nov., 1924	2½ p.c.*
Esperanza (10s)	—/2½	—/2½	—/2½		
Frontino & Bolivia (£1)	14/6	14/3	14/3	July, 1927	5 p.c.
Mexican Corpn. (£1)	9/3	8/6	9/3		
Mexico Mines of El Oro (£1)	16/3	15/—	16/3	Dec., 1926	3¾ p.c.*
N'Changa Copper Mining	11/10½	9/—	9/6		
Oroville Dredging (£1)	5/1½	4/4½	5/1	Dec., 1923	3¾ p.c.
Ouro Preto (£1)	3/—	2/6	3/—	May, 1925	2½ p.c.
Rhodesian Congo Border (£1)	48/9	43/9	45/—		
St. John del Rey (£1)	11/—	10/9	11/—	May, 1927	3¾ p.c.
San Francisco Mines (10s)	28/—	27/—	27/9	July, 1927	15s.
Santa Gertrudis (£1)	17/3	16/4½	17/—	July, 1927	7½ p.c.
Selukwe (2s. 6d.)	8/9	8/3	8/6	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	3/—	2/9	2/9	Nov., 1917	75 p.c.
Tanganyika (£1)	62/9	47/6	52/6	Aug., 1926	7½ p.c.
Union Miniere du Haut-Katanga (Brussels)	10.150	9.875	9.960	July, 1927	182.60 (‡)

* Free of British income tax. † Swiss francs and plus 15 p. c. bonus. ‡ Belgian frs. and free of taxation.

Modern Equipment

An Improved Floodlight

A COMPLETE new line of floodlights that are in accordance with the latest practice in floodlighting has been introduced by the Crouse-Hinds Co., of Syracuse, N. Y. They are equipped with reflectors of special design, which intercept a much larger proportion of the light from the lamp than do the ordinary floodlights. They project into the beam a larger proportion of light and are much more efficient than the types



This floodlight is inclosed in a dust-tight weather-proof case

of floodlights which have been manufactured in the past. Tests have shown that in some cases one of the new 1,000-watt floodlights will replace two old-style 1,000-watt floodlights and give the same amount of light for half the current consumption and half the maintenance cost.

These floodlights are made in four sizes, 12, 16, 20, and 24 inches in diameter. They will accommodate either standard bulb lamps or special concentrated filament lamps in all sizes from 200-watt to 1,500-watt.

The cases of the floodlights are dust-tight and weatherproof. The large radiating surface makes ventilation unnecessary. It has formerly been the practice to ventilate floodlights, but recent developments have shown that it is much better to make the floodlight dust-tight and take care of the heat by radiation. The ventilated floodlight sucks in air and with it all of the gas, dust, and smoke which is also present. This material collects on the reflector, the lamp bulb, and the lens, and it does not take long for the light output to be reduced to a small fraction of its initial value. It would take a maintenance man a long time to clean a number of floodlights on the inside, whereas the new floodlights are so designed that they stay clean on the inside, and it is only necessary to occasionally wipe off the outside of the lens.

Floodlight projectors are often mounted on the edge of tower platforms or roofs, and unless special provision is made, it is practically impossible to clean and relamp the projector without losing the original setting of the floodlight and having to adjust it again at night. To provide for this, this type of floodlight can be supplied with two very simple devices by means of which the projector can be turned around or tipped completely over or both, for convenience in relamping and cleaning, and then be returned to the exact original setting without further adjustments.

When floodlight projectors are used for lighting railroad or factory yards, the area immediately beneath the projector, between the tower and the place where the main beam strikes, is generally dark. This type of floodlights can be supplied with large cast aluminum alloy hoods which reflect the stray light above the beam to the ground. These hoods also prevent soot and dust from falling on the lens. The floodlights can also be supplied with hammered-glass reflectors. These reflectors eliminate the filament image and the uneven appearance of the beam, which are generally produced by the large filament of a standard lighting service lamp, and leave a beam which is slightly wider but much uniform.

Anti-friction Conveyor Idler Recently Introduced

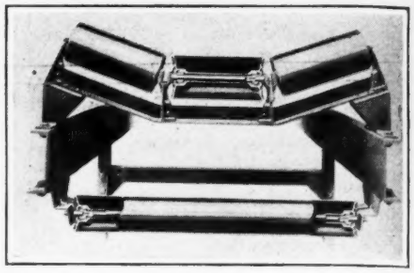
AN anti-friction belt conveyor idler and return rolls of an advanced type of belt conveyor equipment has recently been introduced. This equipment is said to embody many salient features of advantage in design which are the result of years of study and research.

The outstanding feature of the idler is the absolute protection afforded by a labyrinth grease seal, mounted in a grease cap which also serves as an outboard reservoir and lubricates the bearing on the outside as well as on the inside, especially when the roll is on an incline. This, in turn, is protected by a deflector plate which deflects dirt, dust, grit, or any foreign material away from the bearings and grease seal, and will not permit the washing of the grease away from the labyrinth.

The rolls are mounted on a self-cleaning "T" base. All rolls are interchangeable, being capable of serving in any of the three positions. The entire frame is riveted, and is without bolt or nut to work loose or to come out of adjustment.

Bearings are tapered roller-bearing type, which are totally incased within the roll hub.

Another advantage claimed is the close working tolerances to which all parts are built, more closely than have ever been attempted in belt conveyor



Three-roll anti-friction troughing idler and return idler. The "cut away" shows the construction of the rolls.

history. The use of specially constructed manufacturing tools assures alignment of bearings, and a well-balanced concentrically running roll.

Special care is exercised in the machining of the roll shell, to obtain uniformity of thickness of the wall into which the machined heads are pressed and securely held in place by spinning. The heads are dished for rigidity and strength.

It is claimed, also, that the design and construction of the roll make it practicable to vary the characteristics of the material used for the roll shell. Further, a special iron has been developed for use in coke plants, that resists the corrosive action of sulphuric fumes and the abrasiveness of coke dust.

The idler rolls are supported in malleable iron brackets having a large bearing surface for supporting them, and they are not dependent upon the use of slots. The brackets are so constructed as to support the ends of two adjacent rolls, thus obtaining perfect alignment of rolls. Roll shafts are supported at both ends close to the rolls, without overhang, thus reducing the bending moment to a mimimum.

The rolls are spaced far enough apart to permit convenient removal from the frame by simply lifting them out without the use of any tools.

This improved idler is manufactured by the Link Belt Co., of Chicago.

Trade Catalogs

HOISTS—Bulletin No. 43, Nordberg Manufacturing Co., Milwaukee, Wis. Mine hoist installations. Pp. 32, illustrated.

TURBINES — Bulletin GEA-598 General Electric Co., Schenectady. Covers turbines 2,000 to 6,000 kw. capacity. Pp. 12. Illustrated. Also, Bulletin GEA-578A. Mechanical drive turbines, Type D. Pp. 8.

SWITCHES — Bulletin GEA-597A, General Electric Co., Schenectady, N. Y. Push- and pull-button control switches.

ROCK DRILLS — Bulletin 81-G, Sullivan Machinery Co., Chicago. Air feed stoping drills, DU-48 rotating, and DT-44 light stoper, dry and water types.